

Prepared for:
Solutia, Inc.
St. Louis, Missouri

Creek Segment B



Creek Segment C



Creek Segment D



Creek Segment E



Creek Segment F



Sauget Area 1 Dead Creek Final Remedy Creek Bottom Soil Engineering Evaluation/Cost Analysis Human Health Risk Assessment

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Sauget Area 1

Dead Creek Final Remedy - Creek Bottom Soil
Engineering Evaluation/Cost Analysis
Human Health Risk Assessment

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List of Acronyms

AAF	Absorption Adjustment Factor
ACS	American Cancer Society
AOC	Administrative Order by Consent
ARAR	Applicable or Relevant and Appropriate Requirement
ATSDR	Agency for Toxic Substances and Disease Registry
CADD	Chronic Average Daily Dose
CAS	Chemical Abstracts Service
COC	Constituent of Concern
COPC	Constituent of Potential Concern
CSF	Cancer Slope Factor
CSM	Conceptual Site Model
DAF	Dermal Absorption Factor
DQL	Data Quality Level
EE/CA	Engineering Evaluation/Cost Analysis
EFH	Exposure Factors Handbook
ELCR	Excess Lifetime Cancer Risk
EPC	Exposure Point Concentration
HEAST	Health Effects Assessment Summary Tables
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
IEPA	Illinois Environmental Protection Agency
IRIS	Integrated Risk Information System
LADD	Lifetime Average Daily Dose
LMS	Linearized Multi-Stage
LOAEL	Lowest Observed Adverse Effect Level
MLE	Most Likely Exposure
MRL	Minimal Risk Level
NCEA	National Center for Environmental Assessment
NCP	National Contingency Plan
NOAEL	No Observed Adverse Effect Level
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
PPRTV	Provisional Peer-Reviewed Toxicity Value
PQL	Practical Quantitation Limit

PRG	Preliminary Remediation Goal
QAPP	Quality Assurance Project Plan
RAGS	Risk Assessment Guidance for Superfund
RfD	Reference Dose
RME	Reasonable Maximum Exposure
SOW	Scope of Work
SSL	Soil Screening Level
SSP	Support Sampling Plan
SVOC	Semi-Volatile Organic Compound
TACO	Tiered Approach to Corrective Action Objectives
TCDD	Tetrachlorodibenzo-p-dioxin
TEF	Toxic Equivalence Factor
TEQ	Toxic Equivalence Concentration
UAO	Unilateral Administrative Order
UCL	Upper Confidence Limit
USEPA	U.S. Environmental Protection Agency
VOC	Volatile Organic Compounds
WHO	World Health Organization

1.0 Introduction

This report presents the baseline human health risk assessment (HHRA) for creek bottom soils in Dead Creek Segments B-F and Site M, Sauget Area 1, located in Sauget and Cahokia, Illinois, and is part of the Dead Creek Final Remedy Engineering Evaluation/Cost Analysis (EE/CA). The environmental data used in this HHRA were collected from each Creek Segment after the sediment removal action was conducted under the unilateral administrative order (UAO).

The HHRA was conducted in accordance with the United States Environmental Protection Agency (USEPA) approved Human Health Risk Assessment Workplan (HHRA Workplan) dated June 25, 1999 (including the August 6, 1999 revised pages), which was submitted as Volume 1B of the Support Sampling Plan (SSP) for Sauget Area 1 (Solutia, 1999). The HHRA Workplan was also provided as Appendix A of the USEPA-approved Human Health Risk Assessment for Sauget Area 1 (Solutia, 2001). The HHRA approach used in this document was updated to be consistent with current guidance documents that were not available in 1999 (i.e., USEPA, 2002a, USEPA, 2002b, USEPA, 2003, USEPA, 2004a).

The HHRA was conducted using data from environmental samples collected from Dead Creek Segments B-F and Site M. Validated laboratory analytical data are compiled the EE/CA report. The study area is indicated in Figure 1-1 and described in more detail in Section 2.

Baseline Risk Assessment

The purpose of the baseline HHRA is to evaluate potential human health effects of chronic exposures to constituents detected in samples of environmental media collected from the study area.

The HHRA was conducted to be consistent with USEPA guidance for conducting a risk assessment including, but not limited to, the following:

- Risk Assessment Guidance for Superfund (RAGS): Volume 1 - Human Health Evaluation Manual (Parts A and D) (USEPA, 1989a and 1998a).
- Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions (USEPA, 1991a).
- USEPA Soil Screening Guidance: User's Guidance Manual, and Technical Background Document (USEPA, 1996a,b).
- Human Health Evaluation Manual Supplemental Guidance; Standard Default Exposure Factors. OSWER Directive 9285.6-03 (USEPA, 1991b).
- Exposure Factors Handbook (EFH) (USEPA, 1997a).
- Land Use in CERCLA Remedy Selection Process. OSWER Directive No. 9355.7-04 (USEPA, 1995a).

In addition, elements of the Illinois Environmental Protection Agency (IEPA) Tiered Approach to Corrective Action Objectives (TACO) (IEPA, 1998) were used in the conduct of the HHRA.

The baseline HHRA has been conducted in accordance with the four-step paradigm for human health risk assessments developed by USEPA (USEPA, 1989a); these steps are:

- Data Evaluation and Hazard Identification
- Toxicity Assessment
- Exposure Assessment

- Risk Characterization

Report Organization

A description of the site is presented in Section 2.0. The baseline HHRA is presented in Sections 3.0 through 6.0 of this report. Section 7.0 presents the summary and conclusions and Section 8.0 provides the references. A summary of the information presented in each section of the report follows.

- Section 2.0 – Site Characterization. This section discusses the site and its environs, describes source areas, potential migration pathways, and potentially impacted media.
- Section 3.0 – Data Evaluation and Hazard Identification. This section presents a summary of the site data for use in the HHRA, and the results of the process used for the selection of constituents of potential concern (COPCs) to be quantitatively evaluated in the baseline HHRA.
- Section 4.0 – Dose-Response Assessment. The dose-response assessment evaluates the relationship between the magnitude of exposure (dose) and the potential for occurrence of specific health effects (response) for each COPC. Both potential carcinogenic and noncarcinogenic effects are considered. This section presents the quantitative dose-response values used in the baseline HHRA. The most current USEPA verified dose-response values are used when available.
- Section 5.0 – Exposure Assessment. The purpose of the exposure assessment is to provide a quantitative estimate of the magnitude and frequency of potential exposure to COPCs by a receptor. This section presents the updated conceptual site model (CSM) originally presented in the HHRA Workplan. Potentially exposed individuals, and the pathways through which those individuals may be exposed to COPCs are identified based on the physical characteristics of the site, as well as the current and reasonably foreseeable future uses of the site and surrounding area. The extent of a receptor's exposure is estimated by constructing exposure scenarios that describe the potential pathways of exposure to COPCs and the activities and behaviors of individuals that might lead to contact with COPCs in the environment.
- Section 6.0 – Risk Characterization. Risk characterization combines the results of the exposure assessment and the toxicity assessment to derive site-specific estimates of potentially carcinogenic and noncarcinogenic risks resulting from both current and reasonably foreseeable potential human exposures to COPCs. The results of the risk characterization are used to identify constituents of concern (COCs), which are a subset of those COPCs whose risks result in an exceedance of the target risk range of 1×10^{-6} to 1×10^{-4} for potential carcinogens and a target Hazard Index of one for noncarcinogens (that act on the same target organ), as defined in the Administrative Order by Consent Scope of Work (AOC SOW), USEPA guidance (USEPA, 1991a), and by IEPA (1998). The target risk levels used for the identification of COCs are based on USEPA guidance and Illinois TACO guidance. Specifically, USEPA provides the following guidance (USEPA, 1991a):

“Where the cumulative carcinogenic site risk to an individual based on reasonable maximum exposure for both current and future land use is less than 10^{-4} , and the non-carcinogenic hazard quotient is less than 1, action generally is not warranted unless there are adverse environmental impacts.” and,

“The upper boundary of the risk range is not a discrete line at 1×10^{-4} , although EPA generally uses 1×10^{-4} in making risk management decisions. A specific risk estimate around 10^{-4} may be considered acceptable if justified based on site-specific conditions.”

IEPA provides the following summary for the evaluation of cumulative risk for carcinogens (IEPA, 1998, Fact Sheet 13: Mixture Rule):

“The cumulative risk of carcinogenic contaminants attacking the same target must not exceed 1 in 10,000 [10^{-4}]. Therefore, the risk from all on-site similar acting carcinogens must be added

together. If this cumulative risk level is greater than 1 in 10,000, corrective action must be taken to reach an acceptable risk level."

Within any of the steps of the risk evaluation process described above, assumptions must be made due to a lack of absolute scientific knowledge. Some of the assumptions are supported by considerable scientific evidence, while others have less support. The assumptions that introduce the greatest amount of uncertainty in this risk evaluation are discussed in Section 6.0.

- Section 7.0 – Summary and Conclusions. This section presents a summary of the results of the baseline HHRA.
- Section 8.0 – This section presents the references used in the text.

Tables and figures are provided after Section 8.

2.0 Site Characterization

This HHRA addresses data from creek bottom soil samples collected from Dead Creek and Site M. Specifically, this HHRA for Saugat Area 1 addresses creek bottom soil in the following areas:

- Site M
- Dead Creek Segments: B, C, D, E, and F

2.1 Study Area Description

Figure 1-1 presents the study area addressed by this HHRA.

Dead Creek is an intermittent urban stream that bisects Saugat Area 1, passing through areas of commercial land use, areas of open land, and areas of residential land use, and eventually discharges to Borrow Pit Lake and Prairie DuPont Creek. The Borrow Pit Lake was formed as the result of the excavation of borrow material in the mid-1950's for local construction, including the levy. Photographs of Creek Segments B-F are provided in Attachment A.

Conceptual Site Model

To guide identification of appropriate exposure pathways for evaluation in the risk assessment, a CSM for human health was developed. The purpose of the CSM is to identify source areas, potential migration pathways of constituents from source areas to environmental media where exposure can occur, and to identify potential human receptors. The CSM is meant to be a "living" model that can be updated and modified as additional data become available.

The initial CSM for the site is presented in Figure 2-1 of the HHRA Workplan (Solutia, 1999). An updated CSM for the creek bottom soils is presented in Section 5.0, based on the data evaluation and COPC selection conducted in Section 3.0.

3.0 Data Evaluation and Hazard Identification

The purpose of the data evaluation and hazard identification process is two-fold: 1) to evaluate the nature and extent of release of constituents present at the site; and 2) to select a subset of these constituents identified as COPCs for quantitative evaluation in the risk assessment. This step of the risk assessment involves compiling and summarizing the data for the risk assessment, and selecting COPCs based on a series of screening steps.

3.1 Data Evaluation

The HHRA was conducted using validated data collected from Dead Creek and Site M after remediation activities were complete. Data used in the HHRA are presented in the EE/CA report.

3.1.1 Areas and Media

This risk assessment evaluates creek bottom soils in Dead Creek, including Creek Segments B, C, D, E, F, and Site M. Creek bottom soil sample locations included in the risk assessment are identified on Figure 3-1. Each Creek Segment and Site M are being evaluated as separate areas in the risk assessment.

3.1.2 Analytes

The SSP identified the suites of analytes for each medium. For ease of discussion here, the analytes included in the risk assessment are identified as follows:

- Full suite of analytes – volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, mercury, cyanide, polychlorinated biphenyls (PCBs), pesticides, and herbicides;
- Dioxins – dioxins and furans.

All analytical data collected in support of the SSP were compiled and tabulated in a database for statistical analysis. These data are presented in the EE/CA report.

3.1.3 Summary Statistics

The data for each area were summarized for use in the risk assessment. The following guidance documents were used to develop the summary statistics:

- Risk Assessment Guidance for Superfund: Volume I – Human Health Evaluation Manual, Part A (USEPA, 1989a).
- Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites (USEPA, 2002a).

The steps used to summarize the data by area for use in identifying COPCs in the screening process presented in this section are discussed here. The additional steps used to summarize the data for identifying exposure point concentrations (EPCs) are presented in Section 5.0.

The steps used to summarize the data by area are as follows:

Treatment of Non-Detects:

- Summary statistics were not calculated for constituents that were not detected in a particular area.

- Where constituents are detected in some samples and not in others in a particular area/medium, an appropriate statistical technique for dealing with non-detected results was determined based on USEPA guidance for calculating exposure point concentrations (USEPA, 2002a). The guidance presents three methods for handling non-detects:
 1. Simple substitution. In this method, a constant value or fraction of the detection limit (i.e., $\frac{1}{2}$ detection limit) is used as a proxy concentration.
 2. Bounding methods. This method is used to determine the upper and lower bounds of the UCL based on the full range of possible values for the detection limit, and is not based on the distribution of the data. If bounding indicates that the effects of the non-detects are negligible, no further analysis is required.
 3. Distributional methods. This method relies on the assumption that the shape of the distribution of the non-detects is similar to that of the detected concentrations, and derives proxy concentrations based on that distribution.

Simple substitution was applied in this case.

- For all non-detects for which $\frac{1}{2}$ the detection limit was calculated, $\frac{1}{2}$ the detection limit was compared to the maximum detected concentration for that area. Where $\frac{1}{2}$ the detection limit was greater than the maximum detected concentration in a particular area/medium, the detection limit value was not used in the calculation of summary statistics for that constituent in that area and medium (USEPA, 1989a).

Treatment of Duplicates: Data for samples and their duplicates were averaged before summary statistics were calculated, such that a sample and its duplicate were treated as one sample for calculation of summary statistics (including maximum detection and frequency of detection).

Frequency of Detection: The frequency of detection is reported as three numbers indicating the number of samples reported as detected for a specific constituent, the number of samples used to calculate statistics (reflecting the treatment of non-detects described above) and the total number of samples analyzed.

Minimum Detected Concentration: This is the minimum detected concentration for each constituent/area/medium combination, after duplicates have been averaged.

Maximum Detected Concentration: This is the maximum detected concentration for each constituent/area/medium combination, after duplicates have been averaged.

Average Concentration: This is the arithmetic mean concentration for each constituent/area/medium combination, after duplicates have been averaged and non-detects have been evaluated.

Data for all samples, as presented in the EE/CA report, were used in this evaluation. Attachment B presents the summary statistics for each Creek Segment and for Site M.

3.2 Methodology for Selection of Constituents of Potential Concern

COPCs are a subset of the complete list of constituents detected in site media that are carried through the quantitative risk assessment process. Selection of COPCs focuses the analysis on the most likely risk “drivers.” As stated in USEPA guidance (USEPA, 1993a):

“Most risk assessments are dominated by a few compounds and a few routes of exposure. Inclusion of all detected compounds at a site in the risk assessment has minimal influence on

the total risk. Moreover, quantitative risk calculations using data from environmental media that may contain compounds present at concentrations too low to adversely affect public health have no effect on the overall risk estimate for the site. The use of a toxicity screen allows the risk assessment to focus on the compounds and media that may make significant contributions to overall risk."

Several factors are typically considered in selecting COPCs for a site, including natural background, frequency of detection, and toxicity, including essential nutrient status. Each of these evaluation steps is called a "screening step." Risk calculations are conducted using the COPCs identified in these steps.

The steps used to identify COPCs are presented below.

3.2.1 Evaluation of Frequency of Detection and Essential Nutrient Status

Per the HHRA Workplan (Solutia, 1999), a frequency of detection screen was conducted on creek bottom soils. According to this screening step, constituents that are detected in fewer than 5% of samples, provided 20 samples are available, would not be included as COPCs, though some of these constituents would be retained as COPCs based on professional judgment, considering factors such as the presence of a hotspot. Based on the summary statistics (Attachment B) several constituents meet the criteria of low frequency of detection. These constituents were not eliminated from the risk assessment based on frequency of detection, but rather were evaluated through the rest of the COPC selection process. All but one of these constituents (4-nitroaniline in Creek Segment B) was eliminated from further evaluation based on the toxicity screen described in Section 3.2.3. Although 4-nitroaniline could be eliminated as a COPC based on frequency of detection, it was retained for further evaluation in Creek Segment B. In addition, essential nutrients (i.e., calcium, iron, magnesium, sodium and potassium) were not included as COPCs per the HHRA Workplan and USEPA guidance (Solutia, 1999, and USEPA, 1989a).

3.2.2 Comparison to Background

Background samples were collected in the vicinity of the site to provide information on naturally-occurring levels of constituents typical for the local area. The purpose of comparing site conditions to local background is to determine if site concentrations of constituents are representative of background concentrations, which, therefore, should not be included in risk calculations. Background comparisons were conducted for creek bottom soil using site-specific background data.

Four creek sediment samples were collected from reference locations as part of the original SSP (Solutia, 1999), as there are no upgradient locations in Dead Creek outside of the study area.

The procedure for determining whether a constituent concentration is consistent with background follows that developed by USEPA Region 4 (USEPA, 2000) and presented in the HHRA Workplan (Solutia, 1999). Maximum detected concentrations of constituents in environmental media at the site were compared to two times the arithmetic mean site-specific background concentration. USEPA Region 4 states that although RAGS (USEPA, 1989a) allows the use of statistics in data evaluation, statistics may not be sufficiently conservative at this stage of the risk evaluation; and in most cases, there are not a sufficient number of samples for conducting a statistical analysis. Therefore, if maximum concentrations of inorganic constituents in an area are found to be less than two times the average background concentrations, then those constituents are eliminated from quantitative evaluation in the risk assessment. Constituents whose maximum detected concentrations are above the defined background levels and not identified as an essential nutrient were retained for evaluation in the next step of the hazard identification process (Toxicity Screen).

The calculation of background concentrations is presented in Attachment C. It should be noted that arsenic in Creek Segment C was the only constituent eliminated as a COPC based solely on the background screening step.

3.2.3 Toxicity Screen

A toxicity screen was performed in accordance with USEPA Region 5 guidance (USEPA, 1998b) and IEPA regulations (IEPA, 1998).

3.2.3.1 Sources of Screening Criteria

USEPA Region 5 guidance identifies the following three sources as appropriate screening levels for soil, in order of preference:

- 1) Most recent generic soil screening levels (SSLs) developed and presented in Appendix A of the Soil Screening Guidance (USEPA, 1996b). The SSLs are based on ingestion and inhalation (direct contact) and soil-to-groundwater exposure pathways for a residential scenario.
- 2) Site-specific SSLs derived using the methodology outlined in the above reference.
- 3) Most recent USEPA Region 9 Preliminary Remediation Goals (PRGs; USEPA, 2004b).

The IEPA TACO program (IEPA, 1998) is very similar to that outlined in the SSL guidance (USEPA, 1996a) in that it provides Tier I criteria based on direct contact (ingestion and inhalation) and the soil-to-groundwater pathway. In fact, the TACO Tier I criteria have been developed based on the USEPA SSL guidance. However, the TACO Tier I criteria are more comprehensive because values are provided for a longer list of constituents, and Tier I criteria are available for both residential and industrial scenarios.

Therefore, IEPA TACO Tier I criteria were used for the identification of COPCs for creek bottom soil for quantitative evaluation in the risk assessment. Where IEPA TACO Tier I criteria (IEPA, 1998) were not available, structural similarity was used to assign a surrogate TACO Tier 1 criterion, and where this was not possible USEPA Region 9 PRGs (USEPA, 2004b) were used. Residential values were used to identify COPCs for creek bottom soils. Residential USEPA Region 9 PRGs were used as screening criteria for constituents detected in creek bottom soil which lack TACO Tier I criteria. The screening values are presented in Attachment D. It should be noted that the TACO Tier 1 criteria are being used here strictly as screening values; they are not considered either by USEPA or IEPA to be an "applicable or relevant and appropriate requirement" (ARAR) under the National Contingency Plan (NCP) (USEPA, 1990).

The toxicity criteria available at the time of the HHRA Workplan (Solutia, 1999) preparation were used to develop data quality levels (DQLs), which were used to identify appropriate practical quantitation limits (PQLs) for laboratory methods for the analytical program addressed in the Quality Assurance Project Plans (QAPPs) for the site (see Volumes 2B and 3B of the SSP).

As noted in the HHRA Workplan, the PRGs are periodically updated by USEPA. The most current criteria available at the time of the screening were used in the selection of COPCs. These are the Region 9 PRGs dated October 1, 2004. The screening was conducted in January 2006.

The as-published sources of screening criteria are presented in the HHRA Workplan Appendices. The TACO Tier I values are presented in Solutia, 2001. The PRGs presented in the HHRA workplan have been superceded by the October 1, 2004 version, which is available at
<http://www.epa.gov/region09/waste/sfund/prg/index.html>.

Attachment D presents the specific screening values used for the creek bottom soil – direct contact screen.

3.2.3.1 Screening Methodology

Constituents in an area with maximum concentrations less than or equal to the toxicity screening criteria were not included as COPCs. Where no COPCs are identified for an area, that area is not evaluated quantitatively in the HHRA.

3.3 Hazard Identification

This section presents the results of the creek bottom soil COPC screening process.

Maximum constituent concentrations in creek bottom soil for Dead Creek Segments B-F and Site M were compared to residential soil screening values for direct contact, per the HHRA Workplan (Solutia, 1999) and as described above. The screening table is presented in Attachment E.

The selected COPCs are indicated for each Creek Segment as well as Site M in Table 3-1. A total of fifteen constituents were selected as COPCs, including arsenic, copper, polycyclic aromatic hydrocarbons (PAHs), PCBs, dioxin, and several SVOCs. Note that not every constituent is selected as a COPC in each area. The specific COPCs selected for each area are marked with an "X" in Table 3-1. Also note that no COPCs were identified for Creek Segment C.

4.0 Dose Response Assessment

The purpose of the dose-response assessment is to identify the types of adverse health effects a constituent may potentially cause, and to define the relationship between the dose of a constituent and the likelihood or magnitude of an adverse effect (response) (USEPA, 1989a). Adverse effects are classified by USEPA as potentially carcinogenic or noncarcinogenic (i.e., potential effects other than cancer). Dose-response relationships are defined by USEPA for oral exposure and for exposure by inhalation. Oral toxicity values are also used to assess dermal exposures, with appropriate adjustments, because USEPA has not yet developed values for this route of exposure. Combining the results of the toxicity assessment with information on the magnitude of potential human exposure provides an estimate of potential risk.

Numerical toxicity values are generally obtained from USEPA databases/sources. The dose-response relationship is often determined from laboratory studies conducted under controlled conditions with laboratory animals. These laboratory studies are controlled to minimize responses due to confounding variables, and are conducted at relatively high dose levels to ensure that responses can be observed using as few animals as possible in the experiments. Humans are typically exposed to constituents in the environment at levels much lower than those tested in animals. Mathematical models or uncertainty factors are used to extrapolate the relatively high doses administered to animals to predict potential human responses at dose levels far below those tested in animals. These low doses may be detoxified or rendered inactive by the myriad of protective mechanisms that are present in humans (Ames et al., 1987) and that may overestimate potential health effects in humans, and may not function at the high dose levels used in animal experiments. Therefore, the results of these animal studies may only be of limited use in accurately predicting a dose-response relationship in humans. However, to be protective of human health, USEPA incorporates many conservative assumptions and safety factors when deriving numerical toxicity criteria from laboratory studies, as discussed below.

This section contains six subsections. Section 4.1 describes the sources of toxicity values. Section 4.2 describes USEPA's approach for developing noncarcinogenic toxicity values. Section 4.3 describes the toxicity values developed by USEPA for the evaluation of potential carcinogenic effects. Section 4.4 describes the method used to evaluate dermal absorption of constituents in creek bottom soils. Section 4.5 discusses PCB dose-response issues, and Section 4.6 discusses dioxin dose-response issues.

4.1 Sources of Dose-Response Values

The USEPA's guidance regarding the hierarchy of sources of human health dose-response values in risk assessment was followed (USEPA, 2003). Sources of the published dose-response values in this risk assessment include USEPA's Integrated Risk Information System (IRIS) (USEPA, 2006), Provisional Peer-Reviewed Toxicity Values (PPRTVs) obtained from the USEPA Region 9 PRG Table (USEPA, 2004b), the USEPA National Center for Environmental Assessment (NCEA) in Cincinnati, Ohio, Minimal Risk Levels (MRLs) published by the Agency for Toxic Substances and Disease Registry (ATSDR, 2005), and the Health Effects Assessment Summary Tables (HEAST) (USEPA, 1997b).

The primary USEPA source of dose-response values is IRIS, an on-line computer database of toxicological information (USEPA, 2006). The IRIS database is updated monthly to provide the most current USEPA verified dose-response values. As defined by the USEPA (1997b), a dose-response value is "Work Group-Verified" if all available information on the value has been examined by an Agency Work Group, the value has been calculated using current Work Group methodology, a unanimous consensus has been reached on the value by the Work Group, and the value appears on IRIS.

When a dose-response value is not available from IRIS, PPRTVs or other provisional values published by the USEPA NCEA in Cincinnati were used. Values were obtained from NCEA papers where available. The NCEA generally provides a toxicological summary for the value. The USEPA Region 9 PRG Table (USEPA, 2004b)

was also used as a source of these values. MRLs (ATSDR, 2005) were used where PPRTVs were not available.

If dose-response values were not available from any of the above sources, dose-response values were obtained from USEPA's HEAST (USEPA, 1997b). HEAST was formerly published annually by the USEPA and provides a compilation of dose-response values available at the time of publishing. Because HEAST is no longer updated regularly, the dose-response values provided may not represent the most current values available. In addition, the dose-response values provided by HEAST are considered to be provisional, i.e., the value has had some form of agency review, but does not appear on IRIS. The HEAST values may or may not have been generated through the Agency Work Group process, but the values generally use all available information, use current methodology, and a consensus was reached by Agency scientists on the value. HEAST is, therefore, considered to be an unverified source of dose-response values and should be used only if no dose-response value is available from IRIS or the NCEA. Therefore, the hierarchy of dose-response value sources correlates in general with the level of confidence in the values, with the values directly provided by HEAST having the least level of confidence. The only HEAST values used in this HHRA are for 1,4-dichlorobenzene, copper, and dioxin.

The provisional dose response values were approved via electronic mail from Nabil Fayoumi (USEPA) to Steven Smith (Solutia) on April 7, 2006.

4.2 Noncarcinogenic Dose-Response Assessment

Constituents with known or potential noncarcinogenic effects are assumed to have a dose below which no adverse effect occurs or, conversely, above which an adverse effect may be seen. This dose is called the threshold dose. A conservative estimate of the true threshold dose is called a No Observed Adverse Effect Level (NOAEL). The lowest dose at which an adverse effect has been observed is called a Lowest Observed Adverse Effect Level (LOAEL). By applying uncertainty factors to the NOAEL or the LOAEL, Reference Doses (RfDs) for chronic exposure to constituents with noncarcinogenic effects have been developed by USEPA (1997b, 2004b, 2006).

In regulatory toxicity assessment, USEPA assumes that humans are as sensitive, or more sensitive, to the toxic effects of a constituent as the most sensitive species used in the laboratory studies. Moreover, the RfD is developed based on the most sensitive or critical adverse health effect observed in the study population, with the assumption that if the most critical effect is prevented, then all other potential toxic effects are prevented. Uncertainty factors are applied to the NOAEL (or LOAEL, when a NOAEL is unavailable) for this critical effect to account for uncertainties associated with the dose-response relationship. These include using an animal study to derive a human dose-response value, extrapolating from a LOAEL to a NOAEL, extrapolating from a subchronic (partial lifetime) to a chronic lifetime exposure, and evaluating sensitive subpopulations. Generally, a 10-fold factor is used to account for each of these uncertainties; thus, the total uncertainty factor can range from 10 to 10,000. In addition, an uncertainty factor or a modifying factor of up to 10 can be used to account for inadequacies in the database or other uncertainties. The resulting RfDs are very conservative, i.e., health protective, because of the use of the large uncertainty factors. For constituents with noncarcinogenic effects, an RfD provides reasonable certainty that no noncarcinogenic health effects are expected to occur even if daily exposures were to occur at the RfD level for a lifetime. RfDs and exposure doses are expressed in units of milligrams of constituent per kilogram of body weight per day (mg/kg-day). The lower the RfD value, the lower is the assumed threshold for effects, and the greater the assumed toxicity.

Table 4-1 summarizes the toxicity information for COPCs with potential noncarcinogenic effects for the oral route of exposure. For each COPC, the chemical abstracts service number (CAS number), the dose-response value (RfD), and the reference for the dose-response value are presented. In addition, the USEPA confidence level in the value, the uncertainty factor, the modifying factor, the study animal, study method, target organ and critical effect upon which the dose-response value is based are also presented for each COPC, where available. The confidence level is provided for constituents published on IRIS, and is based on the confidence

in the study and the extent of toxicity information available for that constituent. Adjustments for dermal absorption are discussed in Section 4.4.

No inhalation exposure scenarios are evaluated in this risk assessment. Therefore, inhalation dose-response information is not presented.

4.3 Carcinogenic Dose-Response Assessment

USEPA has developed new carcinogen risk assessment guidelines (USEPA, 2005) that revise and replace the previous carcinogen risk assessment guidelines. However, the carcinogen risk assessments for many of the constituents listed in USEPA's IRIS database still follow the classification system developed in the previous guidance (USEPA, 1999). The classification system in the previous guidance was developed according to the weight of evidence from epidemiologic and animal studies:

- Group A - Human Carcinogen (sufficient evidence of carcinogenicity in humans)
- Group B - Probable Human Carcinogen (B1 - limited evidence of carcinogenicity in humans; B2 - sufficient evidence of carcinogenicity in animals with inadequate or lack of evidence in humans)
- Group C - Possible Human Carcinogen (limited evidence of carcinogenicity in animals and inadequate or lack of human data)
- Group D - Not Classifiable as to Human Carcinogenicity (inadequate or no evidence)
- Group E - Evidence of Noncarcinogenicity for Humans (no evidence of carcinogenicity in adequate studies)

In the previous guidance, it was assumed that there is some finite level of risk associated with each non-zero dose. The USEPA has developed computerized models that extrapolate dose-response relations observed at the relatively high doses used in animal studies to the low dose levels encountered by humans in environmental situations. The mathematical models developed by USEPA assume no threshold, and use both animal and human data (where available) to develop a potency estimate for a given constituent. The potency estimate, called a cancer slope factor (CSF) is expressed in units of $(\text{mg/kg-day})^{-1}$; the higher the CSF, the greater the carcinogenic potential.

USEPA (2005) places greater emphasis on critically evaluating all available data from which a default option may be invoked if needed in the absence of critical information. The guidance also emphasizes the use of mode of action data. Mode of action is defined as a sequence of key events and processes, starting with interaction of an agent with a cell and resulting in cancer formation. Some modes of action are anticipated to be mutagenic and are assessed with a linear approach. Other modes of action may be modeled with either linear or nonlinear approaches after a rigorous analysis of available data under the guidance provided in the framework for mode of action analysis. USEPA (2005) uses a weight of evidence narrative rather than the classification system that was used in the previous guidance. The following descriptors are recommended along with the weight of evidence narrative:

- Carcinogenic to humans – this descriptor indicates strong evidence of human carcinogenicity.
- Likely to be carcinogenic to humans – this descriptor is appropriate when the weight of evidence is adequate to demonstrate carcinogenic potential to humans.

- Suggestive evidence of carcinogenic potential – this descriptor is appropriate when the weight of evidence is suggestive of carcinogenicity; a concern for potential carcinogenic effects in humans is raised, but the data are judged not sufficient for a stronger conclusion.
- Inadequate information to assess carcinogenic potential – this descriptor is appropriate when available data are judged inadequate for applying one of the other descriptors.
- Not likely to be carcinogenic to humans – this descriptor is appropriate when the available data are considered robust for deciding that there is no basis for human hazard concern.

More than one descriptor can be used when a constituent's effects differ by dose or exposure route.

Table 4-2 summarizes the toxicity information for COPCs classified by the USEPA as potential carcinogens for the oral route of exposure. For each constituent, the CAS number, USEPA carcinogenicity class, the oral cancer-slope factor and the reference are provided. In addition, the study animal and route of exposure upon which the CSF is based are presented. Adjustments for dermal absorption are discussed in Section 4.4.

No inhalation exposure scenarios are evaluated in this risk assessment. Therefore, inhalation dose-response information is not presented.

4.4 Absorption

Dermal and oral absorption factors are discussed below.

4.4.1 Dermal Absorption

As there are no dermal dose-response values, oral dose-response values are used to evaluate dermal exposures. The equation for calculating dermal absorption gives rise to an absorbed dose, making it necessary to adjust the oral toxicity factor to account for an absorbed rather than an administered dose. This adjustment accounts for the absorption efficiency in the critical study, which forms the basis of the RfD or CSF. For example, in the case where oral absorption in the critical study is essentially complete (i.e., 100%), the absorbed dose is equivalent to the administered dose, and therefore no adjustment is necessary. USEPA (2004a, Exhibit 4-1) provides recommended adjustment factors for oral dose-response values. For organic constituents, no adjustment is considered necessary, since their gastrointestinal absorption is generally high. As indicated in Tables 4-1 and 4-2, USEPA (2004a) does not recommend an adjustment for any of the COPCs evaluated in this HHRA.

The next step is to determine dermal absorption fractions for COPCs in soil. The dermal absorption fraction (DAF) accounts for lower absorption through the skin. USEPA (2004a) provides constituent-specific dermal absorption fractions for a limited number of constituents. Table 4-3 shows the dermal absorption fractions for each of the COPCs.

4.4.2 Oral Absorption Adjustment Factors

Bioavailability is the measure of the degree to which a constituent may be systemically absorbed following exposure. In accordance with USEPA guidance (USEPA, 1989a, 1992c), absorption adjustment factors (AAFs) for bioavailability were used in conducting this risk assessment. To estimate the potential risk to human health that may be posed by the presence of COPCs in creek bottom soils, it is first necessary to estimate the human exposure dose of each constituent. The exposure dose is then combined with an estimate of the toxicity of the constituent to produce an estimate of risk posed to human health.

The estimate of toxicity of a constituent, the dose-response value, can be derived from human epidemiological data, but it is most often derived from experiments with laboratory animals. The dose-response value can be

calculated based on the administered dose of the constituent (similar to the human exposure dose) or, when data are available, based on the absorbed dose, or internal dose, of the constituent.

In animals, as in humans, the administered dose is not necessarily completely absorbed. Moreover, differences in absorption exist between laboratory animals and humans, as well as between different media and routes of exposure. Therefore, it is not always appropriate to directly apply a dose-response value to the human exposure dose. In many cases, a correction factor in the calculation of risk is needed to account for differences between absorption in the toxicity study and absorption likely to occur upon human exposure to a constituent. Without such a correction, the estimate of human health risk could be over- or under-estimated.

This correction factor is termed the absorption adjustment factor, or AAF. The AAF is used to adjust the human exposure dose so that it is expressed in the same terms as the doses used to generate the dose-response curve in the dose-response study. The AAF is the ratio between the estimated human absorption for the specific medium and route of exposure, and the known or estimated absorption for the laboratory study from which the dose-response value was derived.

$$\text{AAFs} = \frac{\text{fraction absorbed in humans for the environmental exposure}}{\text{fraction absorbed in the dose - response study}}$$

The use of an AAF allows appropriate adjustments to be made to the administered dose of a constituent when the efficiency of absorption between environmental exposure and experimental exposure is known or expected to differ because of physiological effects and/or matrix or vehicle effects.

AAFs can have numerical values less than one or greater than one. When the toxicity curve is based on administered dose data, and if it is estimated that the fraction absorbed from the site-specific exposure or medium is the same as the fraction absorbed in the laboratory study, then the AAF is 1.0. This does not mean that there is 100% absorption, only that the magnitude of absorption is the same in both cases. There are situations in which it is expected that the fraction absorbed from a site-related exposure would be higher than that in the laboratory study. There are also situations where the reverse could occur. Thus, use of AAFs provides more accurate and more realistic estimates of potential human health risk. USEPA recommended values were used for dermal exposures (USEPA, 2004a). Oral AAFs were derived by ENSR (see Attachment F). In the absence of detailed toxicological information on a COPC, a default value of 1.0 is used for oral exposures.

Support for the Use of AAFs in Agency Guidance

The use of absorption factors is recommended by USEPA for use in risk assessment when the "medium of exposure in the site exposure assessment differs from the medium of exposure assumed by the dose-response value" (USEPA, 1989a). In other guidance (USEPA, 1992a), USEPA states:

The applied dose, or the amount that reaches exchange boundaries of the skin, lung or gastrointestinal tract, may often be less than the potential dose if the material is only partly bioavailable. Where data on bioavailability are known, adjustments to the potential dose to convert it to applied dose and internal dose may be made.

This may be done by adding a bioavailability factor (range: 0 to 1) to the dose equation. The bioavailability factor would then take into account the ability of the constituent to be extracted from the matrix, absorption through the exchange boundary, and any other losses between ingestion and contact with lung or gastrointestinal tract.

Oral AAFs used in this risk assessment are presented in Table 4-3. The derivation of the non-default (arsenic, PAHs, PCBs, and dioxin) oral AAFs are presented in Attachment F to this document.

4.5 PCB Dose-Response

The biphenyl structure of PCBs consists of two aromatic 6-member rings connected by a single bond. There are five locations on each ring that can be chlorinated, and there are 209 individual PCB congeners, each identified by a unique congener number. Structurally, PCB congeners can be classified into groups based on the number of chlorines per molecule (e.g., monochloro-, dichloro-, trichloro-, up to decachloro-biphenyl). These groups are referred to as homologs.

Aroclor mixtures are the commercial mixtures of PCBs that were used in industry. The Aroclors are identified numerically (e.g., Aroclor 1260, Aroclor 1016). The higher the Aroclor number, the more enriched is the mixture in congeners containing higher numbers of chlorines. Each Aroclor mixture exhibits a characteristic, however overlapping, range of congeners, and Aroclors are identified and quantitated in samples by comparing the sample results to Aroclor standards. Total PCBs in a sample can be calculated by summing the Aroclor concentrations. Alternatively, PCBs can be quantitated by homolog and the homolog concentrations summed to give a total PCB concentration. This latter method was used in this HHRA. Calculation of Total PCB concentrations following the steps outlined in Section 3.1.3 are presented in Attachment B.

Risks from potential exposures to PCBs have been calculated using the most current guidance available from USEPA. Currently, USEPA-approved guidance is provided in IRIS (USEPA, 2006). Total PCB concentrations were calculated by summing the separate homolog concentrations. The total PCB concentrations were used to calculate the PCB exposure dose to be combined with the verified cancer slope factors listed in IRIS (USEPA, 2006). Guidance provided in IRIS specifies three tiers of human slope factors for environmental PCBs: high risk and persistence, low risk and persistence, and lowest risk and persistence. The choice of slope factors for use depends on the route and medium of exposure and PCB chlorine content, as outlined in IRIS (USEPA, 2002a). These values are presented in Table 4-4. Based on a review of the CSF selection criteria, the CSF value of 2 (mg/kg-day)⁻¹ was used in this HHRA for all exposure routes.

Non-cancer risks from potential exposures to PCBs were calculated using the most conservative RfD for a PCB mixture, the oral reference dose for Aroclor 1254 of 2E-05 mg/kg-day.

4.6 Dioxin Dose-Response

The potential carcinogenic effects associated with exposure to dioxin and furan congeners in environmental media were assessed in accordance with the approach developed by USEPA as follows. Risks were calculated for 2,3,7,8-tetrachloro-dibenzo-p-dioxin (2,3,7,8-TCDD) and the dioxin and furan congeners using the cancer slope factor for 2,3,7,8-TCDD listed in HEAST and using the toxic equivalency factors (TEFs) provided by World Health Organization (WHO) (Van den Berg et al., 1998). The TEFs are fractions that equate the potential toxicity of each congener to that of 2,3,7,8-TCDD. The TEFs are listed in Table 4-5. For each sample, the reported sample concentration (or half the detection limit, as appropriate, for non-detected congeners) for each dioxin and furan congener having a TEF listed by WHO was multiplied by its TEF, resulting in a TCDD toxic equivalence concentration (TCDD-TEQ). The TCDD-TEQ values for each of the congeners were then added together for each sample and treated as one sample concentration in the risk assessment. TCDD-TEQ calculations following the steps outlined above and in Section 3.1.3 are presented in Attachment B. The cancer slope factor for 2,3,7,8-TCDD was used to calculate potential carcinogenic risks resulting from potential exposure to 2,3,7,8-TCDD-TEQs.

5.0 Exposure Assessment

The purpose of the exposure assessment is to predict the magnitude and frequency of potential human exposure to each of the COPC retained for quantitative evaluation in the HHRA. The first step in the exposure assessment process is the characterization of the setting of the site and surrounding area. Current and potential future site uses and potential receptors (i.e., people who may contact the impacted environmental media of interest) are then identified. Potential exposure scenarios identifying appropriate environmental media and exposure pathways for current and potential future site uses and receptors are then developed. Those potential exposure pathways for which COPCs are identified and are judged to be complete are evaluated quantitatively in the risk assessment. This information is used to develop or update the CSM for the site.

To estimate the potential risk to human health that may be posed by the presence of COPCs in environmental media in the study area, it is first necessary to estimate the potential exposure dose of each COPC for each receptor. The exposure dose is estimated for each constituent via each exposure route/pathway by which the receptor is assumed to be exposed. Reasonable maximum exposure (RME) scenarios, and most likely exposure (MLE) scenarios based on appropriate USEPA guidance are both evaluated in the quantitative risk assessment. Exposure dose equations combine the estimates of constituent concentration in the environmental medium of interest with assumptions regarding the type and magnitude of each receptor's potential exposure to provide a numerical estimate of the exposure dose. The exposure dose is defined as the amount of COPC taken into the receptor and is expressed in units of milligrams of COPC per kilogram of body weight per day (mg/kg-day). The exposure doses are combined with the dose-response values to estimate potential risks and hazards for each receptor.

This section contains four subsections. Section 5.1 presents the updated CSM for the site. Section 5.2 identifies the potential exposure scenarios and receptors. Section 5.3 presents the exposure parameters, and Section 5.4 presents the methods for quantifying potential exposures.

5.1 Conceptual Site Model

To guide identification of appropriate exposure pathways for evaluation in the risk assessment, a CSM for human health was developed as part of the scoping activities in the HHRA Workplan (Solutia, 1999). The purpose of the CSM is to identify source areas, potential migration pathways of constituents from source areas to environmental media where exposure can occur, and to identify potential human receptors. The CSM is meant to be a "living" model that can be updated and modified as additional data become available.

The initial CSM for the site is presented in the HHRA Workplan (Figure 2-1, Solutia, 1999). Table 5-1 of the HHRA Workplan (Solutia, 1999) presented the matrix of receptors and pathways by area and medium that would be considered for evaluation in the risk assessment. The CSM and the receptor area matrix for creek bottom soil have been updated based on a review of the analytical results and the COPC selection process. The updated creek bottom soil CSM is presented in Figure 5-1. The updated creek bottom soil receptor/area matrix is presented in Table 5-1. Both are discussed below.

5.1.1 Dead Creek

Creek bottom soils in Site M, Creek Segment B through Creek Segment F were collected and analyzed after the UAO sediment removal action was complete. Fifteen COPCs were identified in creek bottom soil as shown in Table 3-1. Therefore, creek bottom soil is evaluated quantitatively in the HHRA as a potential exposure pathway (Figure 5-1).

The exposure scenarios (exposure pathways, exposure routes, and receptors) quantitatively evaluated in the risk assessment have been identified based on this current CSM. They are discussed in the next section.

5.2 Identification of Potential Exposure Scenarios and Receptors

Exposure scenarios are developed on the basis of the CSM for a site. A general identification of exposure pathways, exposure routes, and receptors is provided in the CSM (Figure 5-1) and Table 5-1, the receptor/area matrix. Table 5-1 was derived from the HHRA Workplan Table 5-1, based on the updated CSM presented above and results of the COPC identification process presented in Section 3.0.

Access to Dead Creek is generally uncontrolled except for Creek Segment B, which is secured with a fence (see photographs in Attachment A). As sediment was removed from Site M, it was backfilled with soil from an adjoining property, regraded to drain to Creek Segment B, vegetated and surrounded by a fence. Therefore, a recreational receptor (i.e., child or teenager) could be exposed to COPCs in creek bottom soil of Creek Segment B through Creek Segment F. Given that access to Site M is limited, it is unlikely that any recreational receptor would gain access. However, it has been assumed that a recreational teenager could climb the fence and could be exposed to creek bottom soils in Site M. It was assumed that a recreational child could not access Site M. Due to the presence of underground utility lines in several of the Creek Segments, it is possible that excavation work may occur in the future. Therefore, a construction worker receptor could be exposed to COPCs in creek bottom soil of Site M, and Creek Segment B through Creek Segment F during excavation.

5.3 Exposure Parameters

The exposure assumptions used in this HHRA were presented in the HHRA Work Plan (Solutia, 1999) and were derived mainly from USEPA guidance documents, including the EFH (USEPA, 1997a) and the Human Health Exposure Manual (USEPA, 1991a). Exposure assumptions were updated where necessary to reflect current guidance. For instance, the soil-to-skin adherence factors for soil were used to evaluate sediments, in accordance with USEPA (2004a), and the construction worker soil ingestion rate recommended in USEPA (2002b) was used.

Exposure assumptions for the recreational teenager under the RME and MLE scenarios are shown in Table 5-2. Exposure assumptions for the recreational child under the RME and MLE scenarios are shown in Table 5-3. Exposure assumptions for the construction worker under the RME and MLE scenarios are shown in Table 5-4. The soil ingestion rates used for the construction worker are described below.

The soil ingestion rate for the construction worker is discussed in greater detail below.

Soil Ingestion Rate – Adult Construction Worker

Currently, there are little or no reliable quantitative data available for estimating occupational adult soil ingestion rates. USEPA risk assessment guidance suggests a soil ingestion rate of 330 mg/day for construction workers (USEPA, 2002b). Therefore, a soil ingestion rate of 330 mg/day is used for the construction worker in the RME scenario. The following text describes the derivation of an alternative construction worker soil ingestion rate for use in the MLE scenario.

Soil ingestion may occur as a result of hand-to-mouth transfer. Therefore, the amount of soil that may adhere to a receptor's hands is critical in determining the amount of soil that may be ingested by that receptor. In 1993, USEPA sponsored a workshop to evaluate soil-to-skin adherence data. A study to characterize soil-to-skin adherence was sponsored by the USEPA and conducted by John C. Kissel and associates at the University of Washington (Kissel et al., 1996; Holmes et al., 1999). The intent of this study was to resolve uncertainties and develop more accurate measures of soil-to-skin loading rates for various occupational and recreational activities. As reported in the EFH (USEPA, 1997a), soil loading on skin surfaces as a result of

various occupational and recreational activities was directly measured. This study indicates that soil loadings vary with the type of activity and the body parts contacted. As one would expect, adherence appears to be greatest during outdoor activities such as farming and gardening, and more soil/dust tends to adhere to the hands and knees than to other areas of the body.

Average hand soil loading factors are as presented in the EFH (USEPA, 1997a) for the adult outdoor workers evaluated by Kissel and Holmes. The range of soil adherence loadings measured by Kissel and Holmes falls within the USEPA range of 0.2 to 1.0 mg/cm² (USEPA, 1992b).

For this evaluation, the construction worker receptor is assumed to be exposed to COPCs in creek bottom soils during excavation activity. Based on this exposure scenario, the "farmer" receptor provided in the EFH is considered to provide an upper-bound estimate of adherence. An ingestion rate can be calculated by substituting the adherence value for the receptor for the estimated value derived by Hawley (1985), as follows:

$$\frac{480 \text{ mg / day}}{3.5 \text{ mg / cm}^2} = \frac{\text{ingestion rate (mg / day)}}{\text{soil adherence (mg / cm}^2)}$$

The soil to hand adherence value for the "farmer" is 0.47 mg/cm². The calculated ingestion rate is 64 mg/day; therefore, an ingestion rate of 64 mg/day is used for the MLE construction worker receptor in this risk evaluation.

Additional support for this value comes from a paper by Kissel and coworkers (Kissel et al., 1998) that presents the results of a study of the transfer of soil from hand to mouth by intentional licking. Soil was loaded onto the skin by pressing the hand onto soil, and the amount transferred to the mouth was measured. The thumb sucking, finger mouthing, and palm licking activities resulted in geometric mean soil mass transfers of 7.4 to 16 mg per event. The author concludes that "transfer of 10 mg or more of soil from a hand to the oral cavity in one event is possible, but requires moderate soil loading and more than incidental hand-to-mouth contact." However, "the fraction of soil transferred from hand to mouth that is subsequently swallowed is unknown but may be less than 100 percent." In addition, "the adult volunteers in this study reported that the presence of roughly 10 mg of soil in the mouth is readily detected (and unpleasant). Repeated unintentional ingestion of that mass of soil by adults therefore seems unlikely."

Therefore, for the MLE scenario, an ingestion rate of 64 mg/day is used for the construction worker. For the RME scenario, an ingestion rate of 330 mg/day is assumed for the construction worker. This is the construction worker soil ingestion rate provided by USEPA (2002b).

5.4 Quantification of Potential Exposures

To estimate the potential risk to human health that may be posed by the presence of COPCs at the site, it is first necessary to estimate the potential exposure dose of each COPC. The exposure dose is estimated for each constituent via each exposure pathway by which the receptor is assumed to be exposed. Exposure dose equations combine the estimates of constituent concentration in the environmental medium of interest with assumptions regarding the type and magnitude of each receptor's potential exposure to provide a numerical estimate of the exposure dose. The exposure dose is defined as the amount of COPC taken into the receptor and is expressed in units of milligrams of COPC per kilogram of body weight per day (mg/kg-day).

Exposure doses are defined differently for potential carcinogenic and noncarcinogenic effects. The Chronic Average Daily Dose (CADD) is used to estimate a receptor's potential intake from exposure to a COPC with noncarcinogenic effects. According to USEPA (1989a), the CADD should be calculated by averaging the dose over the period of time for which the receptor is assumed to be exposed. Therefore, the averaging period is the same as the exposure duration. For COPCs with potential carcinogenic effects, however, the Lifetime Average Daily Dose (LADD) is employed to estimate potential exposures. In accordance with USEPA (1989a) guidance, the LADD is calculated by averaging exposure over the receptor's assumed lifetime (70 years).

Therefore, the averaging period is the same as the receptor's assumed lifetime. The standardized equations for estimating a receptor's average daily dose (both lifetime and chronic) are presented below.

5.4.1 Estimating Potential Exposure to COPCs in Creek Bottom Soil

The following equations are used to calculate the estimated exposure of each receptor to creek bottom soil.

Estimating Potential Exposure from Ingestion of and Dermal Contact with Creek Bottom Soil

Average Daily Dose (Lifetime and Chronic) Following Incidental Ingestion Creek Bottom Soil (mg/kg-day):

$$\text{ADD} = \frac{\text{CS} \times \text{IR} \times \text{EF} \times \text{ED} \times \text{AAF}_o \times \text{CF}}{\text{BW} \times \text{AT}}$$

where:

- ADD = Average Daily Dose (mg/kg-day)
- CS = Soil concentration (mg/kg soil)
- IR = Ingestion rate (mg soil/day)
- EF = Exposure frequency (days)
- ED = Exposure duration (year)
- AAFo = Oral-Soil Absorption Adjustment Factor (unitless)
- CF = Unit conversion factor (kg soil/ 10^6 mg soil)
- BW = Body weight (kg)
- AT = Averaging time (days)

Average Daily Dose (Lifetime and Chronic) Following Dermal Contact with Creek Bottom Soil (mg/kg-day):

$$\text{ADD} = \frac{\text{CS} \times \text{SA} \times \text{AF} \times \text{EF} \times \text{ED} \times \text{DAF} \times \text{CF}}{\text{BW} \times \text{AT}}$$

where:

- ADD = Average Daily Dose (mg/kg-day)
- CS = Soil concentration (mg/kg soil)
- SA = Exposed skin surface area (cm^2/day)
- AF = Soil to skin adherence factor (mg soil/ cm^2)
- EF = Exposure frequency (days)
- ED = Exposure duration (year)

DAF	=	Dermal Absorption Fraction (unitless)
CF	=	Unit conversion factor ($\text{kg soil}/10^6 \text{ mg soil}$)
BW	=	Body weight (kg)
AT	=	Averaging time (days)

Attachment G presents the exposure dose and risk calculation spreadsheets. The risk results are discussed in Section 6.0.

5.4.2 Calculation of Exposure Point Concentrations

Exposure points are located where potential receptors may contact COPCs at or from the site. The concentration of COPCs in the environmental medium that receptors may contact must be estimated in order to determine the magnitude of potential exposure. The estimation of EPCs in media evaluated for the HHRA is discussed below.

The EPC for a human health risk assessment is defined as the 95% upper confidence limit (UCL) on the arithmetic mean concentration, or the maximum concentration, whichever is lower (USEPA, 2002a), for the RME scenario and the arithmetic mean concentration for the MLE scenario.

Summary statistics have been calculated for each COPC in creek bottom soil, as presented in Attachment B. As discussed in Section 3.0, before summary statistics were calculated, the following steps were taken for each COPC. If a constituent was detected at least once in an area, one-half the constituent's quantitation limit was used as a proxy concentration in the estimation of exposure point concentrations for those instances in which the constituent was reported as not detected. However, if the proxy concentration is greater than any detected value in that area/medium, the proxy concentration was removed from the calculation. This is consistent with USEPA guidance (USEPA, 1989a) which recognizes that high sample quantitation limits can lead to unrealistic concentration estimates. Duplicate sample analytical results were averaged, and the average used as the sample point concentration (USEPA, 1989b).

USEPA (2002a) provides guidance on the methodology for calculating 95% UCLs. UCLs were calculated using USEPA's ProUCL Version 3.0 software (USEPA, 2004c). Attachment H presents the UCL calculation output tables from ProUCL. Sample concentrations were entered into the program after non-detects have been handled as described in Section 3.1, and duplicate results have been averaged. The lower of the calculated 95% UCL and the maximum detect was selected as the EPC.

Table 5-5 presents for each COPC the data distribution, the UCL calculation method, and the UCL calculated using ProUCL (USEPA, 2004c). The EPCs for creek bottom soil are presented in Table 5-6 for the RME scenario. The EPCs for creek bottom soil are presented in Table 5-7 for the MLE scenario.

6.0 Risk Characterization

The potential risk to human health associated with potential exposure to COPC in creek bottom soil at the site is evaluated in this step of the risk assessment process. Risk characterization is the process in which the dose-response information (Section 4.0) is integrated with quantitative estimates of human exposure derived in the Exposure Assessment (Section 5.0). The result is a quantitative estimate of the likelihood that humans will experience any adverse health effects given the exposure assumptions made. Two general types of health risk are characterized for each potential exposure pathway considered: potential carcinogenic risk and potential noncarcinogenic risk. Carcinogenic risk is evaluated by averaging exposure over a normal human lifetime, which, based on USEPA guidance (1989a), is assumed to be 70 years. Noncarcinogenic risk is evaluated by averaging exposure over the total exposure period.

Characterization of the potential impact of potential carcinogenic and noncarcinogenic constituents is approached in very different ways. The difference in approaches arises from the conservative assumption that substances with possible carcinogenic action proceed by a no-threshold mechanism, whereas other toxic actions may have a threshold, a dose below which few individuals would be expected to respond. Thus, under the no-threshold assumption, it is necessary to calculate a risk, but for constituents with a threshold, it is possible to simply characterize an exposure as above or below the threshold. In risk assessment, that threshold is termed a reference dose (RfD). Reference doses as well as cancer slope factors were discussed in Section 4.0. The approach to carcinogenic risk characterization is presented in Section 6.1, and the approach to noncarcinogenic risk characterization is presented in Section 6.2. The risk characterization results are presented in Section 6.3. Uncertainties associated with the risk characterization are presented in Section 6.4. The risk calculation spreadsheets are presented in Attachment G.

6.1 Carcinogenic Risk Characterization

The purpose of carcinogenic risk characterization is to estimate the upper-bound likelihood, over and above the background cancer rate, that a receptor will develop cancer in his or her lifetime as a result of exposure to a constituent in environmental media at the site. This likelihood is a function of the dose of a constituent (described in the Exposure Assessment, Section 5.0) and the Cancer Slope Factor (CSF) (described in the Dose-Response Assessment, Section 4.0) for that constituent. The Excess Lifetime Cancer Risk (ELCR) is the likelihood over and above the background cancer rate that an individual will contract cancer in his or her lifetime. The American Cancer Society (ACS) estimates that the lifetime probability of contracting cancer in the U.S. is 1 in 2 for men and 1 in 3 for women (ACS, 2004). The risk value is expressed as a probability (e.g., 10^{-6} , or one in one million). The relationship between the ELCR and the estimated LADD of a constituent may be expressed as:

$$ELCR = 1 - e^{-(CSF \times LADD)}$$

When the product of the CSF and the LADD is much greater than 1, the ELCR approaches 1 (i.e., 100 percent probability). When the product is less than 0.01 (one chance in 100), the equation can be closely approximated by:

$$ELCR = LADD \text{ (mg/kg-day)} \times CSF \text{ (mg/kg-day)}^{-1}$$

The product of the CSF and the LADD is unitless, and provides an upper-bound estimate of the potential carcinogenic risk associated with a receptor's exposure to that constituent via that pathway.

The potential carcinogenic risk for each exposure pathway is calculated for each receptor. In current regulatory risk assessment, it is assumed that cancer risks are additive or cumulative. Pathway and area-specific risks are summed to estimate the total site potential cancer risk for each receptor. A summary of the

total site cancer risks for each receptor group is presented in this section and compared to the USEPA's target risk range of 10^{-4} to 10^{-6} (one in ten thousand to one in one million). Any COPC that causes an exceedence of 10^{-4} risk level for a particular receptor is designated a COC. The target risk levels used for the identification of COCs are based on USEPA guidance and Illinois TACO guidance. Specifically, USEPA provides the following guidance (USEPA, 1991a):

"Where the cumulative carcinogenic site risk to an individual based on reasonable maximum exposure for both current and future land use is less than 10^{-4} , and the non-carcinogenic hazard quotient is less than 1, action generally is not warranted unless there are adverse environmental impacts." and,

"The upper boundary of the risk range is not a discrete line at 1×10^{-4} , although EPA generally uses 1×10^{-4} in making risk management decisions. A specific risk estimate around 10^{-4} may be considered acceptable if justified based on site-specific conditions."

IEPA provides the following summary for the evaluation of cumulative risk for carcinogens (IEPA, 1998, Fact Sheet 13: Mixture Rule):

"The cumulative risk of carcinogenic contaminants attacking the same target must not exceed 1 in 10,000 [10^{-4}]. Therefore, the risk from all on-site similar acting carcinogens must be added together. If this cumulative risk level is greater than 1 in 10,000, corrective action must be taken to reach an acceptable risk level."

Both RME and MLE results are considered in the identification of COCs.

6.2 Noncarcinogenic Risk Characterization

The potential for exposure to a constituent to result in adverse noncarcinogenic health effects is estimated for each receptor by comparing the CADD for each COPC with the RfD for that COPC. The resulting ratio, which is unitless, is known as the Hazard Quotient (HQ) for that constituent. The HQ is calculated using the following equation:

$$HQ = \frac{CADD \text{ (mg/kg-day)}}{RfD \text{ (mg/kg-day)}}$$

The target HQ is defined as a HQ of less than or equal to one (USEPA, 1989a). When the HQ is less than or equal to 1, the RfD has not been exceeded, and no adverse noncarcinogenic effects are expected. If the HQ is greater than 1, there may be a potential for adverse noncarcinogenic health effects to occur; however, the magnitude of the HQ cannot be directly equated to a probability or effect level.

The total Hazard Index (HI) is calculated for each exposure pathway by summing the HQs for each individual constituent. The total site HI is calculated for each potential receptor by summing the HIs for each pathway associated with the receptor. Where the total site HI is greater than 1 for any receptor, a more detailed evaluation of potential noncarcinogenic effects based on specific health or target endpoints (e.g., liver effects, neurotoxicity) is performed (USEPA, 1989a; IEPA, 1998). The target HI is 1 on a per target endpoint basis. Each COPC that causes an exceedance of the HI of 1 for a particular receptor and for a particular target endpoint is designated a COC. Both RME and MLE results are considered in the identification of COCs.

6.3 Risk Characterization Results

Risk characterization results for the recreational teen are presented in Section 6.3.1, for the recreational child in Section 6.3.2, and for the construction worker in Section 6.3.3.

6.3.1 Recreational Teen

Potential carcinogenic risks for the RME and MLE scenarios are presented in Table 6-1, and the potential HIs for the RME and MLE scenarios are presented in Table 6-2. The recreational teen is assumed to be exposed to COPCs in creek bottom soil in Dead Creek Segments B, D, E, F and Site M via incidental ingestion and dermal contact; no COPCs were identified in Creek Segment C.

As indicated in Table 6-1, the potential risks for the recreational teen (RME) for each of the Creek Segments and Site M are below or within the USEPA risk range of 10^{-4} to 10^{-6} . Table 6-1 indicates that the potential risks for the MLE scenario for each of the Creek Segments and Site M are below the USEPA risk range of 10^{-4} to 10^{-6} .

Table 6-2 indicates that the potential HI for the recreational teen (RME) for each of the Creek Segments is below the target HI of 1. The table also indicates that the potential HI for the recreational teen (MLE) for each of the Creek Segments is below the target HI of 1.

6.3.2 Recreational Child

Potential carcinogenic risks for the RME and MLE scenarios are presented in Table 6-3, and the potential HIs for the RME and MLE scenarios are presented in Table 6-4. The recreational child is assumed to be exposed to COPCs in creek bottom soil in Dead Creek Segments B, D, E, and F via incidental ingestion and dermal contact; no COPCs were identified in Creek Segment C, and the child is not assumed to be exposed to Site M.

As indicated in Table 6-3, the potential risks for the recreational child (RME) for each of the Creek Segments are below or within the USEPA risk range of 10^{-4} to 10^{-6} . Table 6-3 indicates that the potential risks for the MLE scenario for each of the Creek Segments are below the USEPA risk range of 10^{-4} to 10^{-6} .

Table 6-4 indicates that the potential HI for the recreational child (RME) for each of the Creek Segments is below the target HI of 1, with the exception of Creek Segment B. The HI for that Creek Segment, which is fenced in, is greater than one (2.32). The exceedance is driven by incidental ingestion and dermal contact with Total PCBs (1.23) and with 2,3,7,8-TCDD-TEQ (0.97). The HI associated with the remaining COPCs in Creek Segment B is below one (0.12). The target endpoint for 2,3,7,8-TCDD-TEQ is developmental effects; as indicated in Table 4-1, the only other COPC with developmental effects is 1,4-dichlorobenzene, which has an HI of 3.28×10^{-5} . Therefore, on a target endpoint basis, the HI of one is exceeded only for Total PCBs. The table indicates that the potential HI for the recreational child under the MLE scenario for each of the Creek Segments, including Creek Segment B, is below the target HI of 1.

The samples in Creek Segment B driving the Total PCB exceedance are CBS-CSB-T0-C and CBS-CSB-T3-E. Both of these sampling locations were excavated as part of the creek bottom soil removal action currently underway. CSB-T0-C was excavated to a depth of two (2) feet and CSB-T3-E was excavated to a depth of five (5) feet. In order to further evaluate the potential HI associated with Total PCBs in Creek Segment B, the RME EPC was re-calculated using samples remaining after excavation as well as the samples collected in December 2005 as part of the verification sampling conducted after the excavation. The samples used to derive the updated EPC are listed below:

- CBS-CSB-T10-C1
- CBS-CSB-T10-E1
- CBS-CSB-T10-W1
- CBS-CSB-T11-E1
- CBS-CSB-T11-W1
- CBS-CSB-T13-C1
- CBS-CSB-T13-E1
- CBS-CSB-T13-W1
- CBS-CSB-T14-1

- CBS-CSB-T15-1
- CBS-CSB-T17-C1
- CBS-CSB-T17-W1
- CBS-CSB-T18-C1
- CBS-CSB-T18-E1
- CBS-CSB-T18-W1
- CBS-CSB-T3-W1
- CBS-CSB-T4-E1
- CBS-CSB-T4-W1
- CBS-CSB-T5-C1
- CBS-CSB-T5-W1
- CBS-CSB-T7-C1
- CBS-CSB-T7-E1
- CBS-CSB-T7-W1
- CBS-CSB-T9-C1
- CBS-CSB-T9-E1
- CSBT3-1 (post-excavation)
- CSBT3-2 (post-excavation)
- CSBT3-3 (post-excavation)
- CSBT3-4 (post-excavation)

The updated EPC is 0.15 mg/kg (opposed to 21 mg/kg pre-excavation). Attachment H presents the UCL calculation output table from ProUCL for this EPC. This results in an HI for PCBs of 0.009, well below one. Therefore, the HI using data remaining after excavation is below one, and there is no longer a potential HI exceedances for PCBs in Creek Segment B, and no further action is recommended.

6.3.3 Construction Worker

Potential carcinogenic risks for the RME and MLE scenarios are presented in Table 6-5, and the potential HIs for the RME and MLE scenarios are presented in Table 6-6. The construction worker is assumed to be exposed to COPCs in creek bottom soil during excavation in Dead Creek Segments B, D, E, F and Site M via incidental ingestion and dermal contact; no COPCs were identified in Creek Segment C.

As indicated in Table 6-5, the potential risks for the construction worker (RME) for each of the Creek Segments and Site M are below or within the USEPA risk range of 10^{-4} to 10^{-6} . Table 6-5 indicates that the potential risks for the MLE scenario for each of the Creek Segments are below the USEPA risk range of 10^{-4} to 10^{-6} .

Table 6-6 indicates that the potential HI for the construction worker (RME) for Creek Segments D, E, and F are below the target HI of 1. The total HI under the RME scenario for Creek Segment B and Site M are greater than one (discussed in greater detail below). The potential HI for the construction worker (MLE) for each of the Creek Segments and Site M are below the target HI of 1.

The total HI under the RME scenario for Creek Segment B is 1.2, and is driven by incidental ingestion and dermal contact with Total PCBs (0.5) and with 2,3,7,8-TCDD-TEQ (0.6). The HI associated with the remaining COPCs in Creek Segment B is below one (0.1). As indicated in Table 4-1, the target endpoint for Total PCBs is "Ocular, meibomiam gland, finger and toenail, and immune effects", and for 2,3,7,8-TCDD-TEQ is developmental effects. None of the other COPCs have these effects. Therefore, on a target endpoint basis, the HI of one is not exceeded. In addition, as discussed in Section 6.3.2, excavation has occurred in Creek Segment B, which significantly reduced PCB concentrations, and a liner will further prevent human contact.

6.4 Uncertainty Analysis

Within any of the four steps of the human health risk assessment process, assumptions must be made due to a lack of absolute scientific knowledge. Some of the assumptions are supported by considerable scientific evidence, while others have less support. Every assumption introduces some degree of uncertainty into the risk assessment process. Regulatory risk assessment methodology requires that conservative assumptions be made throughout the risk assessment to ensure that public health is protected. Therefore, when all of the assumptions are combined, it is much more likely that risks are overestimated rather than underestimated.

The assumptions that introduce the greatest amount of uncertainty in this risk assessment are discussed in this section. They are discussed in qualitative terms, because for most of the assumptions there is not enough information to assign a numerical value to the uncertainty that can be factored into the calculation of risk.

6.4.1 Selection of Constituents of Potential Concern

In the Hazard Identification step, information on constituents detected at the site is combined with criteria quantifying their potential toxicity to obtain a subset of constituents for quantitative evaluation in the risk assessment, the COPCs. The goal is to include in the quantitative portion of the risk assessment those constituents that are the most toxic, prevalent, environmentally-persistent, and mobile. The selection of the COPCs forms the basis of the quantitative risk assessment.

Generally in the site characterization phase of the site assessment, knowledge of past and current land use is used to determine which analytical parameters are analyzed and what analytical methods are employed for the detection of constituents in the relevant environmental media at the site. However, for Saugat Area 1, the knowledge of past and current industrial practices was not used to limit the analyte list. Instead, the majority of environmental samples were analyzed for a full suite of constituents including VOCs, SVOCs, metals, cyanide, PCBs, pesticides, herbicides and dioxins, as detailed in Section 3.1.2.

In the Hazard Identification process, it is assumed that only those constituents detected are actually present at the site. However, it is possible that constituents not on the analyte list may be present at the site. Should this be the case, site risks may be underestimated depending on the nature of the constituents not included in the sample analyses. However, the full suite of USEPA analyte lists were used and are as inclusive as possible of constituents used in industry that are of potential public health concern. Therefore, it is unlikely that constituents not included on the analyte list would be present at the site at concentrations that would pose a risk to public health.

A subset of constituents detected at a site is generally selected for quantitative analysis for several reasons. Some constituents detected at a site may be naturally occurring and not related to site use. Other constituents may be present at concentrations that can be assumed with reasonable assurance not to pose a risk to human health. A review of the results of risk assessments demonstrate that in most cases risks are attributable only to one or a few constituents, and that many of the constituents quantitatively evaluated do not contribute significantly to total risk estimates (USEPA, 1993a). The screening process is conducted to identify the COPCs that may contribute the greatest to potential risk. The screening process used here is conservative. Although the excluded constituents may pose a finite level of risk, that risk would contribute negligibly to the total site risk. Therefore, not evaluating the excluded constituents will not measurably affect the numerical estimates of hazard or risk, and thus not affect remedial decision-making at the site.

In comparison with the list of constituents analyzed in each environmental sample (approximately 180 analytes), relatively few constituents were detected in Dead Creek Segments and Site M, and of these, relatively few COPCs (a total of fifteen) were identified for quantitative evaluation in the risk assessment for creek bottom soil. The COPCs identified are listed in 3-1.

6.4.2 Toxicity Assessment

The purpose of the toxicity assessment is to identify the types of adverse health effects a constituent may potentially cause and to define the relationship between the dose of a constituent and the likelihood or magnitude of an adverse effect (response). Risk assessment methodologies typically divide potential health effects of concern into two general categories: effects with a threshold (noncarcinogenic) and effects assumed to be without a threshold (potentially carcinogenic). Toxicity assessments for both of these types of effects share many of the same sources of uncertainty. To compensate for these uncertainties, USEPA has developed the RfDs and CSF that are biased to overestimate rather than under-estimate human health risks. Several of the more important sources of uncertainty and the resulting biases are discussed below.

6.4.2.1 Animal-to-Human Extrapolation in Noncarcinogenic Dose-Response Evaluation

For many constituents, animal studies provide the only reliable information on which to base an estimate of adverse human health effects. Extrapolation from animals to humans introduces a great deal of uncertainty into the risk characterization. In most instances, it is not known how differently a human may react to the constituent compared to the animal species used to test the constituent. If a constituent's fate and the mechanisms by which it causes adverse effects are known in both animals and humans, uncertainty is reduced. When the fate and mechanism for the constituent are unknown, uncertainty increases.

The procedures used to extrapolate from animals to humans involve conservative assumptions and incorporate uncertainty factors such that overestimation of effects in humans is more likely than underestimation. When data are available from several species, the lowest dose that elicits effects in the most sensitive species is used for the calculation of the RfD. To this dose are applied uncertainty factors, generally of 1 to 10 each, to account for intraspecies variability, interspecies variability, study duration, and/or extrapolation of a low effect level to a no effect level. Thus, most reference doses used in risk assessment are 100- to 10,000-fold lower than the lowest effect level found in laboratory animals.

Nevertheless, because the fate of a constituent can differ in animals and humans, it is possible that animal experiments will not reveal an adverse effect that would manifest itself in humans. This can result in an underestimation of the effects in humans. The opposite may also be true: effects observed in animals may not be observed in humans, resulting in an overestimation of potential adverse human health effects.

6.4.2.2 Evaluation of Carcinogenic Dose-Response

Significant uncertainties exist in estimating dose-response relationships for potential carcinogens. These are due to experimental and epidemiologic variability, as well as uncertainty in extrapolating both from animals to humans and from high to low doses. Three major issues affect the validity of toxicity assessments used to estimate potential excess lifetime cancer risks: (1) the selection of a study (i.e., data set, animal species, matrix the constituent is administered in) upon which to base the calculations, (2) the conversion of the animal dose used to an equivalent human dose, and (3) the mathematical model used to extrapolate from experimental observations at high doses to the very low doses potentially encountered at the site.

Study Selection

Study selection involves the identification of a data set (experimental species and specific study) that provides sufficient, well-documented dose-response information to enable the derivation of a valid CSF. Human data (e.g., from epidemiological studies) are preferable to animal data, although adequate human data sets are relatively uncommon. Therefore, it is often necessary to seek dose-response information from a laboratory species, ideally one that biologically resembles humans (e.g., with respect to metabolism, physiology, and pharmacokinetics), and where the route of administration is similar to the expected mode of human exposure (e.g., inhalation and ingestion). When multiple valid studies are available, the USEPA generally bases CSFs on the one study and site that show the most significant increase in tumor incidence with increasing dose. In some cases this selection is done in spite of significant decreases with increasing dose of tumor incidence in

other organs and total tumor incidence. Consequently, the current study selection criteria are likely to lead to overestimation of potential cancer risks in humans.

Interspecies Dose Conversion

The USEPA derivation of human equivalent doses by conversion of doses administered to experimental animals requires the assumption that humans and animals are equally sensitive to the toxic effects of a substance, if the same dose per unit body surface area is absorbed by each species. Although such an assumption may hold for direct-acting genotoxins, it is not necessarily applicable to many indirect acting carcinogens and likely overestimates potential risk by a factor of 6 to 12 depending on the study species (USEPA, 1992e). Further assumptions for dose conversions involve standardized scaling factors to account for differences between humans and experimental animals with respect to life span, body size, breathing rates, and other physiological parameters. In addition, evaluation of risks associated with one route of administration (e.g., inhalation) when tests in animals involve a different route (e.g., ingestion) requires additional assumptions with corresponding additional uncertainties. Although USEPA has formally changed its default position for scaling animal data to humans from a per surface area to a per body weight basis (USEPA, 1992e), changes to existing CSF will only be made when the USEPA commits to a formal review of a constituent's dose-response profile, and as of this writing, few have been incorporated.

High-to-Low Dose Extrapolation

The concentration of constituents to which people are potentially exposed at industrial sites is usually much lower than the levels used in the studies from which dose-response relationships are developed. Estimating potential health effects at such sites, therefore, requires the use of models that allow extrapolation of health effects from high experimental doses in animals to low environmental doses. These models are generally statistical in character and have little or no biological basis. Thus the use of a model for dose extrapolation introduces uncertainty in the dose-response estimate. In addition, these models contain assumptions that may also introduce a large amount of uncertainty. Generally the models have been developed to err on the side of over-estimating rather than under-estimating potential health risks.

Most of the USEPA CSFs listed in IRIS are derived using the upper 95% confidence limit of the slope predicted by the linearized multi-stage (LMS) model used to extrapolate low dose risk from high dose experimental data. USEPA recognizes that this method produces very conservative risk estimates, and that other mathematical models exist. USEPA states that the upper-bound estimate generated by the LMS model leads to a plausible upper limit to the risk that is consistent with some of the proposed mechanisms of carcinogenesis. The true risk, however, is unknown and may be as low as zero. The LMS model is very conservative as it assumes strict linearity between the lowest dose that produced an effect and zero dose. However, the body has many mechanisms to detoxify constituents, especially at low doses, and many mechanisms to repair damages if they should occur. Therefore, many scientists believe that most constituents can cause cancer only above a "threshold" dose. This phenomenon of a threshold for carcinogenic activity has been demonstrated for chloroform (as reviewed in Bradley, 1996).

USEPA's current carcinogen risk assessment guidelines (USEPA, 2005) emphasizes mode of action data, and recognizes that some carcinogens may act in a nonlinear fashion. Therefore, it is recognized that some carcinogens may have a threshold dose below which effects would not be seen.

6.4.3 Exposure Assessment

Exposure assessment consists of three basic steps: 1) development of exposure scenarios, (2) estimation of exposure point concentrations, and 3) estimation of human dose.

6.4.3.1 Exposure Scenarios

Exposure scenarios in a risk assessment are selected to be representative of potential exposures to COPCs in media that may be experienced by human receptors based on current and reasonably foreseeable land use. These exposure scenarios are developed for a hypothetical receptor, but one that would represent the RME scenario for the site. Therefore, exposure levels are assumed for these receptors (recreational and construction in this case), that are much greater than expected to occur in an actual population. The use of the MLE scenarios provides an estimate of exposures more likely to represent average exposures. The MLE risk estimates are used to put the RME risk estimates into context.

6.4.3.2 Estimation of Exposure Point Concentrations

Sample Statistics. Exposure to COPCs at the site is best estimated by the use of the arithmetic mean concentration of a COPC in each medium. Because of the uncertainty associated with estimating the true average concentration at a site, the USEPA has required the use of the 95% UCL on the arithmetic mean as the EPC (USEPA, 2002a). Therefore, this is a very conservative estimate of the true arithmetic mean. RME EPCs in this risk assessment represent the lower of the maximum detected concentration or the 95% UCL on the mean (USEPA, 2002a). Again to provide context, the MLE calculations have used the arithmetic mean concentration, not the upper bound, as the EPC.

Sample Location. In addition, the data used to calculate the EPCs are assumed to be representative of general site conditions. Sample locations in the sites and transects were identified to be as representative of site conditions as possible.

Environmental Degradation. Finally, it is assumed that the EPCs calculated in the risk assessment based on current site conditions remain constant for the assumed exposure duration – for the recreational scenario evaluated in this risk assessment, this is a period of 6 years for the child and 11 years for the teenager, and for the construction scenario, exposure could occur at any time in the future. However, it is well known in the scientific community that constituents in the environment are subject to natural attenuation and biodegradation processes. Organic constituents are naturally degraded in the environment by a variety of processes (i.e., photodegradation, microbial activity, hydrolysis, etc.). USEPA has recognized the validity and utility of natural attenuation and biodegradation as a remedial option and has recently published guidance for its site-specific implementation (USEPA, 1997c). Environmental half-lives vary for specific constituents based on environmental conditions (i.e., presence of bacteria, pH, exposures to sunlight and oxygen), and there are respected literature sources of such information. However, environmental degradation is not typically accounted for in the calculation of risks for the site. This has likely resulted in an over-estimation of site risks.

6.4.3.3 Exposure Assumptions

When estimating potential human doses (i.e., intakes) from potential exposure to various media containing COPCs, several assumptions are made. Uncertainty may exist, for example, in assumptions concerning rates of ingestion, frequency and duration of exposure, and bioavailability of the constituents in the medium. Typically, when limited information is available to establish these assumptions, a conservative (i.e., health-protective) estimate of potential exposure is employed. Default exposure assumptions recommended by the USEPA are intended to be conservative and representative of an individual who consistently and frequently contacts environmental media at a site, a scenario that rarely occurs. Most individuals will contact media at non-site locations, while the risk assessment assumes that all exposure to environmental media will occur at the site. Moreover, it is often assumed that contact with environmental media occurs in the areas having the highest constituent concentrations for the entire exposure frequency/duration used in the risk assessment, due to both statistical handling of the data and the original sampling plan. The use of conservative assumptions is likely to lead to an overestimate of potential risk.

6.4.4 Risk Characterization

The potential risk of adverse human health effects is characterized based on estimated potential exposures and potential dose-response relationships. Three areas of uncertainty are introduced in this phase of the risk assessment: the evaluation of potential exposure to multiple constituents, the combination of upper-bound exposure estimates with upper-bound toxicity estimates, and the risk to sensitive populations.

6.4.4.1 Risk from Multiple Constituents

Once potential exposure to and potential risk from each COPC is estimated, the total upper-bound potential risk posed by the site is determined by combining the estimated potential health risk from each of the COPC. Presently, potential carcinogenic effects are added unless evidence exists indicating that the COPC interact synergistically (a combined effect that is greater than a simple addition of potential individual effects) or antagonistically (a combined effect that is less than a simple addition of potential individual effects) with each other. For most combinations of constituents, little if any evidence of interaction is available. Therefore, additivity is assumed. Although the IEPA TACO program provides a listing of groups of constituents that are considered to be additive in their carcinogenic potential, the USEPA approach of assuming additivity across all constituents was used in this risk assessment.

For noncarcinogenic effects, the HI should only be summed for constituents that have the same or similar toxic endpoints (USEPA, 1989a). The toxic endpoint is defined as the most sensitive noncarcinogenic health effect used to derive the RfD or other suitable dose-response value (USEPA, 1989a). Again, there is little evidence to suggest whether those COPCs associated with a common toxicity endpoint are additive, synergistic, antagonistic, or independent in terms of mechanism of action. Whether assuming additivity leads to an underestimation or overestimation of risk is unknown.

6.4.4.2 Combination of Several Upper-Bound Assumptions

Generally, the goal of a risk assessment is to estimate an upper-bound, but reasonable, potential exposure and risk. Most of the assumptions about exposure and toxicity used in this evaluation are representative of statistical upper-bounds or even maxima for each parameter. The result of combining several such upper-bound assumptions is that the final estimate of potential exposure or potential risk is extremely conservative (health-protective).

This is best illustrated by a simple example. Assume that potential risk depends upon three variables (soil consumption rate, COPC concentration in soil and CSF). The mean, upper 95% bound and maximum are available for each variable.

One way to generate a conservative estimate of potential risk is to multiply the upper 95% bounds of the three parameters in this example. Doing so assumes that the 5% of the people who are most sensitive to the potential carcinogenic effects of a COPC will also ingest soil at a rate that exceeds the rate for 95% of the population, and that all the soil these people eat will have a constituent concentration that exceeds the concentration in 95% of the soil on site. The consequence of these assumptions is that the estimated potential risk is representative of 0.0125% of the population ($0.05 \times 0.05 \times 0.05 = 0.000125 \times 100 = 0.0125\%$). Put another way, these assumptions overestimate risks for 9,999 out 10,000 people, or 99.99% of the population. Thus, the majority of people will have a much lower level of potential risk. The very conservative nature of the potential risks estimated by the risk assessment process is not generally recognized. In reality, the estimates are more conservative than outlined above, because usually more than three upper 95% assumptions are used to estimate potential risk(s).

Alternatively, if a single upper 95% assumption of the cancer slope factor is combined with average (50th percentile) assumptions for soil concentration and soil ingestion rate, the resulting estimates of potential risk still overpredict risk for 99% of the potentially exposed population. This is a conservative and health protective

approach that substantially overestimates the “average” level and even the reasonable maximum level of potential risk.

The risk assessment approach used here employed upper 95% bounds or maxima for most RME exposure and toxicity assumptions. Thus, it produces estimates of potential risk two to three orders of magnitude greater than the risk experienced by the average member of the potentially exposed populations. The MLE scenarios have used average estimates of exposure where possible, but still use the conservative dose-response values, thus even the MLE risk estimates are likely to overestimate total risk.

6.4.4.3 Risk to Sensitive Populations

The health risks estimated in the risk characterization generally apply to the receptors whose activities and locations were described in the exposure assessment. Some people will always be more sensitive than the average person and, therefore, will be at greater risk. Dose-response values used to calculate risk, however, are frequently derived to account for additional sensitivity of subpopulations (e.g., the uncertainty factor of 10 used to account for intraspecies differences). Therefore, it is unlikely that this source of uncertainty contributes significantly to the overall uncertainty of the risk assessment.

6.4.5 Summary of Sources of Uncertainty in Human Health Risk Assessment

The large number of assumptions made in the risk characterization introduces uncertainty in the results. While this could potentially lead to underestimates of potential risk, the use of numerous conservative (i.e., protective of human health) assumptions, as was done here, results in overestimates of potential risks. Any one person's potential exposure and subsequent risk are influenced by all the parameters mentioned above and will vary on a case-by-case basis. Despite inevitable uncertainties associated with the steps used to derive potential risks, the use of numerous health-protective assumptions will most likely lead to a very large overestimate of potential risks from the site. Moreover, when evaluating risk assessment results, it is important to put the risks into perspective. For example, the ACS estimates that the lifetime probability of contracting cancer in the U.S. is 1 in 2 for men and 1 in 3 for women (ACS, 2004), while regulatory decision making is based on estimated risks in the one in one million to one in ten thousand risk range. The results of the risk assessment must be carefully interpreted considering the uncertainty and conservatism associated with the analysis, especially where site management decisions are made.

7.0 Summary and Conclusions

This report has presented the baseline HHRA for creek bottom soils in Dead Creek Segments B-F and Site M, Sauget Area 1, located in Sauget and Cahokia, Illinois.

The HHRA was conducted in accordance with the USEPA-approved HHRA Workplan dated June 25, 1999 (including the August 6, 1999 revised pages), which was submitted as Volume 1B of the SSP for Sauget Area 1 (Solutia, 1999), as well as Appendix A to the USEPA-approved HHRA for Sauget Area 1 dated June 1, 2001 (including the August 31, 2001 revised pages) (Solutia, 2001).

The HHRA was conducted using data from environmental creek bottom soil samples collected from the study area after the UAO sediment removal action (shown in Figure 1-1 and described in more detail in Section 2) in accordance with the USEPA-approved SSP. Dead creek bottom soil and its environs including Creek Segments B, C, D, E, and F, and Site M were evaluated. Photographs of Creek Segments B-F are provided in Attachment A.

Background or reference sediment samples collected as part of the original SSP effort (Solutia, 1999) were used in this evaluation. The SSP identified the suites of analytes for each medium. The analytes included in the risk assessment are: VOCs, SVOCs, metals, mercury, cyanide, PCBs, pesticides, herbicides, and dioxins.

The baseline HHRA has been conducted in accordance with the four-step paradigm for human health risk assessments developed by USEPA (USEPA, 1989a); these steps are:

- Data Evaluation and Hazard Identification
- Dose-Response Assessment
- Exposure Assessment
- Risk Characterization

The risk assessment results are summarized by step below.

7.1 Data Evaluation and Hazard Identification

The purpose of the data evaluation and hazard identification process is two-fold: 1) to evaluate the nature and extent of release of constituents present at the site; and 2) to select a subset of these constituents identified as COPCs for quantitative evaluation in the risk assessment. This step of the risk assessment involves compiling and summarizing the data for the risk assessment, and selecting COPCs based on a series of screening steps. Several factors are typically considered in selecting COPCs for a site, including natural background, frequency of detection, and toxicity, including essential nutrient status.

Per the HHRA Workplan (Solutia, 1999), IEPA TACO Tier I criteria (IEPA, 1998) were used for the identification of COPCs for creek bottom soil for quantitative evaluation in the risk assessment. Where IEPA TACO Tier I criteria were not available, USEPA Region 9 PRGs (2004b) were used. Residential values were used to identify COPCs for creek bottom soils.

Background samples were collected in the vicinity of the site to provide information on naturally-occurring levels of constituents typical for the local area. The purpose of comparing site conditions to local background is to determine if site concentrations of constituents are representative of background concentrations, which, therefore, should not be included in risk calculations. Background comparisons were conducted for each medium using site-specific background data.

The procedure for determining whether a constituent concentration is consistent with background follows that developed by USEPA Region 4 (USEPA, 2000a) and presented in the HHRA Workplan (Solutia, 1999). Maximum detected concentrations of constituents in environmental media at the site were compared to two times the arithmetic mean site-specific background concentration. Therefore, if maximum concentrations of constituents in an area are found to be less than two times the average background concentrations, then those constituents are eliminated from quantitative evaluation in the risk assessment.

In the screening process, constituents in an area with maximum concentrations less than or equal to the screening criteria were not included as COPCs. Where no COPCs are identified for an area, that area was not evaluated quantitatively in the HHRA.

Fifteen COPCs were identified in creek bottom soil, as shown in Table 3-1; no COPCs were identified for Creek Segment C.

7.2 Dose-Response Assessment

The purpose of the dose-response assessment is to identify the types of adverse health effects a constituent may potentially cause, and to define the relationship between the dose of a constituent and the likelihood or magnitude of an adverse effect (response) (USEPA, 1989a). Adverse effects are classified by USEPA as potentially carcinogenic or noncarcinogenic (i.e., potential effects other than cancer). Dose-response relationships are defined by USEPA for oral exposure and for exposure by inhalation. Oral dose-response values are also used to assess dermal exposures, with appropriate adjustments, because USEPA has not yet developed values for this route of exposure. Combining the results of the toxicity assessment with information on the magnitude of potential human exposure provides an estimate of potential risk.

Selection of dose-response values followed USEPA guidance (USEPA, 2003). Sources of the published dose-response values in this risk assessment include IRIS (USEPA, 2006), PPRTVs, the USEPA NCEA, ATSDR (2005), and HEAST (USEPA, 1997b).

Risks were calculated for 2,3,7,8-TCDD and the dioxin and furan congeners using the cancer slope factor for 2,3,7,8-TCDD listed in HEAST and using the TEFs provided by WHO (Van den Berg et al., 1998), presented in Table 4-5. The TEFs are fractions that equate the potential toxicity of each congener to that of 2,3,7,8-TCDD.

The provisional dose response values were approved via electronic mail from Nabil Fayoumi (USEPA) to Steven Smith (Solutia) on April 7, 2006.

7.3 Exposure Assessment

The purpose of the exposure assessment is to predict the magnitude and frequency of potential human exposure to each of the COPC retained for quantitative evaluation in the HHRA. The first step in the exposure assessment process is the characterization of the setting of the site and surrounding area. Current and potential future site uses and potential receptors (i.e., people who may contact the impacted environmental media of interest) are then identified. Potential exposure scenarios identifying appropriate environmental media and exposure pathways for current and potential future site uses and receptors are then developed. Those potential exposure pathways for which COPCs are identified and are judged to be complete are evaluated quantitatively in the risk assessment.

7.3.1 Conceptual Site Model

To guide identification of appropriate exposure pathways for evaluation in the risk assessment, a CSM for human health was developed. The purpose of the CSM is to identify source areas, potential migration pathways of constituents from source areas to environmental media where exposure can occur, and to identify potential human receptors.

The CSM for the Sauget Area 1 risk assessment is presented in Figure 5-1. The CSM identifies potential sources, constituent migration pathways from one medium to another, and potential exposure pathways (e.g., creek bottom soil), potential exposure routes (e.g., ingestion, dermal contact), and potential receptors (e.g., recreational teen, recreational child, construction worker).

Creek bottom soil samples were collected and analyzed from Creek Segments B-F of Dead Creek and Site M. The sampling program was developed to provide data to evaluate potential human health effects of chronic daily exposures to constituents detected in samples of creek bottom soil remaining after excavation.

7.3.2 Exposure Point Concentrations

Exposure points are located where potential receptors may contact COPCs at or from the site. The concentration of COPCs in the environmental medium that receptors may contact must be estimated in order to determine the magnitude of potential exposure. The EPC for a human health risk assessment is defined as the 95% UCL on the arithmetic mean concentration, or the maximum concentration, whichever is lower (USEPA, 2002a), for the RME scenario and the arithmetic mean concentration for the MLE scenario. Summary statistics have been calculated for each constituent detected in each area as presented in Attachment B. Calculation of the 95% UCL is dependent upon the distribution of the data set. The 95% UCL calculations were conducted for COPCs as described by USEPA (2002a) using the ProUCL software provided by USEPA (USEPA, 2004c).

The exposure point concentrations for each COPC in creek bottom soil are presented in Section 5 tables for both the RME and MLE scenarios.

7.3.3 Receptor Evaluation

Table 5-1 presents the receptor/pathway/area matrix that summarizes the receptors evaluated in each area, by medium and exposure route. These scenarios were developed based on the data, the CSM, and the COPCs identified in each medium. RME scenarios and MLE scenarios based on appropriate USEPA guidance were both evaluated in the quantitative risk assessment. In all, 28 receptor scenarios (RME and MLE recreational teenager, RME and MLE construction worker - Creek Segments B, D, E, F, and Site M, and RME and MLE recreational child for Creek Segments B, D, E, and F) were evaluated in the Sauget Area 1 Creek Bottom Soils risk assessment.

To estimate the potential risk to human health that may be posed by the presence of COPCs in environmental media in the study area, it is first necessary to estimate the potential exposure dose of each COPC for each receptor. The exposure dose is estimated for each constituent via each exposure pathway by which the receptor is assumed to be exposed. Exposure dose equations combine the estimates of constituent concentration in the environmental medium of interest with assumptions regarding the type and magnitude of each receptor's potential exposure to provide a numerical estimate of the exposure dose. The exposure dose is defined as the amount of COPC taken into the receptor and is expressed in units of milligrams of COPC per kilogram of body weight per day (mg/kg-day). The exposure doses are combined with the dose-response values to estimate potential risks and hazards for each receptor. The exposure dose and risk calculation spreadsheets are presented in Attachment G.

7.4 Risk Characterization

The potential risk to human health associated with potential exposure to COPCs in environmental media at the site is evaluated in this step of the risk assessment process. Risk characterization is the process in which the dose-response information (Section 4.0) is integrated with quantitative estimates of human exposure derived in the Exposure Assessment (Section 5.0). The result is a quantitative estimate of the likelihood that humans will experience any adverse health effects given the exposure assumptions made. Two general types of health risk are characterized for each potential exposure pathway considered: potential carcinogenic risk and

potential noncarcinogenic risk. Carcinogenic risk is evaluated by averaging exposure over a normal human lifetime, which, based on USEPA guidance (1989a), is assumed to be 70 years. Noncarcinogenic risk is evaluated by averaging exposure over the total exposure period.

Characterization of the potential impact of potential carcinogenic and noncarcinogenic constituents is approached in very different ways. The difference in approaches arises from the conservative assumption that substances with possible carcinogenic action proceed by a no-threshold mechanism, whereas other toxic actions may have a threshold, a dose below which few individuals would be expected to respond. Thus, under the no-threshold assumption, it is necessary to calculate a risk, but for constituents with a threshold, it is possible to simply characterize an exposure as above or below the threshold. In risk assessment, that threshold is termed an RfD.

7.4.1 Carcinogenic Risk Characterization

The purpose of carcinogenic risk characterization is to estimate the upper-bound likelihood, over and above the background cancer rate, that a receptor will develop cancer in his or her lifetime as a result of exposure to a constituent in environmental media at the site. This likelihood is a function of the dose of a constituent (described in the Exposure Assessment, Section 5.0) and the CSF (described in the Toxicity Assessment, Section 4.0) for that constituent. The ELCR is the likelihood over and above the background cancer rate that an individual will contract cancer in his or her lifetime. The American Cancer Society (ACS) estimates that the lifetime probability of contracting cancer in the U.S. is 1 in 2 for men and 1 in 3 for women (ACS, 2004). The risk value is expressed as a probability (e.g., 10^{-6} , or one in one million). The ELCR is calculated using the following equation:

$$\text{ELCR} = \text{LADD (mg/kg - day)} \times \text{CSF (mg/kg - day)}^{-1}$$

The potential carcinogenic risk for each exposure pathway is calculated for each receptor. In current regulatory risk assessment, it is assumed that cancer risks are additive or cumulative. Pathway and area-specific risks were summed to estimate the total site potential cancer risk for each receptor. A summary of the total site cancer risks for each receptor group were presented in Section 6.0 and compared to the USEPA's target risk range of 10^{-4} to 10^{-6} .

The target risk levels are based on USEPA guidance and Illinois TACO guidance. Specifically, USEPA provides the following guidance (USEPA, 1991a):

"Where the cumulative carcinogenic site risk to an individual based on reasonable maximum exposure for both current and future land use is less than 10^{-4} , and the non-carcinogenic hazard quotient is less than 1, action generally is not warranted unless there are adverse environmental impacts." and,

"The upper boundary of the risk range is not a discrete line at 1×10^{-4} , although EPA generally uses 1×10^{-4} in making risk management decisions. A specific risk estimate around 10^{-4} may be considered acceptable if justified based on site-specific conditions."

IEPA provides the following summary for the evaluation of cumulative risk for carcinogens (IEPA, 1998, Fact Sheet 13: Mixture Rule):

"The cumulative risk of carcinogenic contaminants attacking the same target must not exceed 1 in 10,000 [10^{-4}]. Therefore, the risk from all on-site similar acting carcinogens must be added together. If this cumulative risk level is greater than 1 in 10,000, corrective action must be taken to reach an acceptable risk level."

7.4.2 Non-Carcinogenic Risk Characterization

The potential for exposure to a constituent to result in adverse noncarcinogenic health effects is estimated for each receptor by comparing the CADD for each COPC with the RfD for that COPC. The resulting ratio, which is unitless, is known as the HQ for that constituent. The HQ is calculated using the following equation:

$$HQ = \frac{CADD\text{ (mg/kg - day)}}{RfD\text{ (mg/kg - day)}}$$

The target HQ is defined as an HQ of less than or equal to one (USEPA, 1989a). When the HQ is less than or equal to 1, the RfD has not been exceeded, and no adverse noncarcinogenic effects are expected. If the HQ is greater than 1, there may be a potential for adverse noncarcinogenic health effects to occur; however, the magnitude of the HQ cannot be directly equated to a probability or effect level. HQs for a given pathway are summed to provide a HI. Pathway HIs are summed to provide a total receptor HI. When the HI is less than 1, the target has not been exceeded, and no adverse noncarcinogenic effects are expected. This initial HI summation assumes that all the COPCs are additive in their toxicity, and is considered only a screening step as additive toxicity may not be correct. If the HI is greater than 1, further evaluation is necessary to determine if the COPCs are additive in toxicity. This evaluation is termed a toxic endpoint analysis.

7.4.3 Risk Characterization Results

Tables 7-1 through 7-3 summarize the potential risk and hazard to each receptor. As indicated, the total potential risk for the recreational teen (Table 7-1), the recreational child (Table 7-2) and the construction worker (Table 7-3) for each of the Creek Segments and Site M are below or within the USEPA risk range of 10^{-4} to 10^{-6} . The hazard indices are below one for the recreational teen (Table 7-1). The hazard index for the recreational child (Table 7-2) in Creek Segment B for the RME scenario exceeds one on a target endpoint basis due to the estimated EPC for PCBs. The hazard index for the remaining segments under the RME scenario and for all segments under the MLE scenario is below one. The total hazard index for the construction worker (Table 7-3) exceeds one; however, as discussed in Section 6.3.3, the hazard index of one is not exceeded on a target endpoint basis. Additionally, excavation in this area has significantly reduced PCB concentrations, and a liner will further prevent direct contact.

The HI for the RME recreational child in Creek Segment B for Total PCBs is 1.23. The total HI associated with the remaining constituents below one on a target endpoint basis. The HI under the MLE scenario is below one. The samples in Creek Segment B driving the exceedances are CBS-CSB-T0-C and CBS-CSB-T3-E. Both of these sampling locations were excavated as part of the creek bottom soil removal action currently underway. CSB-T0-C was excavated to a depth of two (2) feet and CSB-T3-E was excavated to a depth of five (5) feet. In order to further evaluate the potential HI associated with Total PCBs in Creek Segment B, the RME EPC was re-calculated using samples remaining after excavation as well as the samples collected in December 2005 as part of the verification sampling conducted after the excavation. This results in an HI for PCBs of 0.009, well below one. In addition, the liner design for Creek Segment B was submitted to USEPA on January 23, 2006. The liner will consist of the following layers (from the top down):

- 12-inches of Riprap
- 6 -inches of Bedding Stone
- 2 layers of 16-oz non-woven geotextile
- 60 mil HDPE membrane
- 1 layer of 8-oz non-woven geotextile

Therefore, there is no longer a potential exposure PCBs in Creek Segment B, and no further action is recommended.

7.5 Summary

Based on the results of this baseline risk assessment for Saugat Area 1 Creek Bottom Soils, it is recommended that no further remedial action is necessary for segments B-F of Dead Creek and Site M. Potential carcinogenic risks are within the target risk range for all areas and the Hazard Index for each area is below 1 for both the recreational teenager, the recreational child and the construction worker, as shown in Tables 7-1, 7-2, and 7-3.

8.0 References

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TABLE 3-1
 CONSTITUENTS OF POTENTIAL CONCERN
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Constituent	CAS	Area					
		Creek Segment B	Creek Segment C	Creek Segment D	Creek Segment E	Creek Segment F	Site M
1,4-Dichlorobenzene	106-46-7	X					X
4-Nitroaniline	100-01-6	X					
Arsenic	7440-38-2	X		X	X	X	X
Benzo(a)anthracene	56-55-3	X					
Benzo(a)pyrene	50-32-8	X		X	X	X	X
Benzo(b)fluoranthene	205-99-2	X					
Bis(2-ethylhexyl)phthalate	117-81-7	X					
Copper	7440-50-8	X			X		X
Dibenzo(a,h)anthracene	53-70-3	X			X		X
Dieldrin	60-57-1	X		X			
Heptachlor	76-44-8						X
Heptachlor epoxide	1024-57-3	X					X
Pentachlorophenol	87-86-5	X					
2,3,7,8-TCDD TEQ	1746-01-6	X					X
Total PCBs	1336-36-3	X		X	X		X
Total:		14		4	5	2	9

Notes:

CAS - Chemical Abstracts Service.

PCB - Polychlorinated Biphenyl.

TCDD-TEQ - Total 2,3,7,8-tetrochloro-dibenzo-p-dioxin Toxicity Equivalents (calculated using Toxicity Equivalency Factors provided by Van den Berg et al., 1998).

X - Constituent of potential concern in this area.

TABLE 4-1

DOSE-RESPONSE INFORMATION FOR COMPOUNDS WITH POTENTIAL NONCARCINOGENIC EFFECTS FROM CHRONIC EXPOSURE THROUGH THE ORAL ROUTE
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Constituent	CAS Number	Oral/Dermal (c) Reference Dose (mg/kg-day)	Reference (Last Verified) Type	EPA Confidence Level	Uncertainty Factor	Modifying Factor	Target Organ/Critical Effect at LOAEL	Study Animal	Study Method	
1,4-Dichlorobenzene	106-46-7	2.40E-03	IRIS (External Review Draft (d))	NA	1000	1	Liver effects and developmental effects	RAT	ORAL:GAVAGE	
4-Nitroaniline	100-01-6	3.00E-03	PPRTV (b, d))	NA	NA	NA	NA	NA	NA	
Arsenic	7440-38-2	3.00E-04	IRIS (1/2006)	MEDIUM	3	1	Hyperpigmentation and keratosis of the skin and possible vascular complications	HUMAN	ORAL:DRINKING WATER	
Benzo(a)anthracene	56-55-3	NA	NA	NA	NA	NA	NA	NA	NA	
Benzo(a)pyrene	50-32-8	NA	NA	NA	NA	NA	NA	NA	NA	
Benzo(b)fluoranthene	205-99-2	NA	NA	NA	NA	NA	NA	NA	NA	
Bis(2-ethylhexyl)phthalate	117-81-7	2.00E-02	IRIS (1/2006)	MEDIUM	1000	1	Increased relative liver weight	GUINEA PIG	ORAL	
Copper	7440-50-8	3.70E-02	HEAST (1997) (d)	NA	NA	NA	GI irritation	HUMAN	ORAL	
Dibenzo(a,h)anthracene	53-70-3	NA	NA	NA	NA	NA	NA	NA	NA	
Dieldrin	60-57-1	5.00E-05	IRIS (1/2006)	MEDIUM	100	1	Liver lesions	RAT	ORAL:DIET	
Heptachlor	76-44-8	5.00E-04	IRIS (1/2006)	LOW	300	1	Increased liver weight	RAT	ORAL:DIET	
Heptachlor epoxide	1024-57-3	1.30E-05	IRIS (1/2006)	LOW	1000	1	Increased liver to body-weight ratios	DOG	ORAL:DIET	
Pentachlorophenol	87-86-5	3.00E-02	IRIS (1/2006)	MEDIUM	100	1	Liver & kidney pathology	RAT	ORAL:DIET	
2,3,7,8-TCDD TEQ	1746-01-6	1.00E-09	ATSDR (12/2005) (d)	NA	NA	NA	Developmental	NA	NA	
Total PCBs	1336-36-3	2.00E-05	(a)	IRIS (1/2006)	MEDIUM	300	1	Ocular, meibomian gland, finger and toenail and immune effects	MONKEY	ORAL:CAPSULE

Notes:

ATSDR - Agency for Toxic Substances and Disease Registry. Minimal Risk Level. December 2005.

CAS - Chemical Abstracts Service.

LOAEL - Lowest Observed Adverse Effects Level.

NA - Not available.

RfD - Reference Dose.

NCEA - National Center for Environmental Assessment.

IRIS - Integrated Risk Information System, an on-line computer database of toxicological information (USEPA, 2006).

HEAST - Health Effects Assessment Summary Tables, published annually by the USEPA (1997b).

PPRTV - Provisional Peer Reviewed Toxicity Value.

(a) Value for Aroclor 1254 (IRIS).

(b) As cited in the USEPA Region 9 Preliminary Remediation Goal (PRG) Table. October, 2004. USEPA, 2004b.

(c) USEPA, 2004. Risk Assessment Guidance for Superfund. Volume 1, Part E, Supplemental Guidance for Dermal Risk Assessment. Exhibit 4-1. No adjustment required; oral reference dose is used to evaluate dermal exposures.

(d) Personal Communication, Milt Clark USEPA. March 29, 2006.

TABLE 4-2

DOSE-RESPONSE INFORMATION FOR COMPOUNDS WITH POTENTIAL CARCINOGENIC EFFECTS BY THE ORAL ROUTE OF EXPOSURE
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Constituent	CAS Number	EPA Carcinogen Class	Oral/Dermal (f) CSF (mg/kg-day) ⁻¹	Oral CSF Reference (Last Verified)	Oral CSF Study Animal	Oral CSF Study Method
1,4-Dichlorobenzene	106-46-7	C	1.30E-02	IRIS (External Review Draft (d))	MOUSE	ORAL:Gavage
4-Nitroaniline	100-01-6	NA	2.10E-02	PPRTV (d,e)	NA	NA
Arsenic	7440-38-2	A	1.50E+00	IRIS (1/2006)	HUMAN	ORAL:DRINKING WATER
Benzo(a)anthracene	56-55-3	B2	7.30E-01 (a)	IRIS (1/2006)	NA	NA
Benzo(a)pyrene	50-32-8	B2	7.30E+00	IRIS (1/2006)	MOUSE	ORAL:DIET
Benzo(b)fluoranthene	205-99-2	B2	7.30E-01 (a)	IRIS (1/2006)	NA	NA
Bis(2-ethylhexyl)phthalate	117-81-7	B2	1.40E-02	IRIS (1/2006)	MOUSE	ORAL:DIET
Copper	7440-50-8	D	NA	IRIS (1/2006)	NA	NA
Dibenzo(a,h)anthracene	53-70-3	B2	7.30E+00 (b)	IRIS (1/2006)	NA	NA
Dieldrin	60-57-1	B2	1.60E+01	IRIS (1/2006)	MOUSE	ORAL:DIET
Heptachlor	76-44-8	B2	4.50E+00	IRIS (1/2006)	MOUSE	ORAL:DIET
Heptachlor epoxide	1024-57-3	B2	9.10E+00	IRIS (1/2006)	MOUSE	ORAL:DIET
Pentachlorophenol	87-86-5	B2	1.20E-01	IRIS (1/2006)	MOUSE	ORAL:DIET
2,3,7,8-TCDD TEQ	1746-01-6	B2	1.50E+05	HEAST (1997) (d)	RAT	ORAL:DIET
Total PCBs	1336-36-3	B2	2.00E+00 (c)	IRIS (1/2006)	RAT	ORAL:DIET

Notes:

CAS - Chemical Abstracts Service.

CSF - Cancer Slope Factor.

NA - Not available.

IRIS - Integrated Risk Information System, an online computer database of toxicological information (USEPA, 2006).

HEAST - Health Effects Assessment Summary Tables, published annually by the USEPA (1997b).

PPRTV - Provisional Peer Reviewed Toxicity Value.

(a) CSF based on that for benzo(a)pyrene and applying a relative potency factor of 0.1 per USEPA Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons (USEPA, 1993b).

(b) CSF based on that for benzo(a)pyrene and applying a relative potency factor of 1.0 per USEPA Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons (USEPA, 1993b).

(c) This is the upperbound CSF for high risk and persistence PCBs. USEPA provides a range of slope factors on IRIS; these will be discussed in the risk characterization.

(d) Personal Communication, Milt Clark USEPA. March 29, 2006.

(e) As cited in the USEPA Region 9 Preliminary Remediation Goal (PRG) Table. October, 2004. USEPA, 2004b.

(f) USEPA, 2004. Risk Assessment Guidance for Superfund. Volume 1, Part E, Supplemental Guidance for Dermal Risk Assessment. Exhibit 4-1.
 No adjustment required; oral CSF is used to evaluate dermal exposures.

TABLE 4-3
 ABSORPTION FRACTIONS
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Constituent	Absorption Fractions			
	Oral		Dermal	
1,4-Dichlorobenzene	1	(d)	0.1	(b)
4-Nitroaniline	1	(d)	0.1	(b)
Arsenic	0.3	(a)	0.03	(b)
Benzo(a)anthracene	0.29	(a)	0.13	(b)
Benzo(a)pyrene	0.29	(a)	0.13	(b)
Benzo(b)fluoranthene	0.29	(a)	0.13	(b)
Bis(2-ethylhexyl)phthalate	1	(d)	0.1	(b)
Copper	1	(d)	1	(c)
Dibenzo(a,h)anthracene	0.29	(a)	0.13	(b)
Dieldrin	1	(d)	0.1	(b)
Heptachlor	1	(d)	0.1	(b)
Heptachlor epoxide	1	(d)	0.1	(b)
Pentachlorophenol	1	(d)	0.25	(b)
2,3,7,8-TCDD TEQ	0.5	(a)	0.03	(b)
Total PCBs	0.83	(a)	0.14	(b)
Notes:				
(a) Derivation provided in Attachment E.				
(b) USEPA, 2004a. Risk Assessment Guidance for Superfund. Vol. 1, Part E. July, 2004. Exhibit 3-4.				
(c) No value provided in (b). Therefore, 100% absorption assumed.				
(d) Default value of 1 assumed.				

TABLE 4-4
 TIERS OF CANCER SLOPE FACTORS FOR ENVIRONMENTAL PCBs (a)
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

HIGH RISK AND PERSISTENCE
Upper-bound slope factor: 2.0 per (mg/kg)/day Central-estimate slope factor: 1.0 per (mg/kg)/day
Criteria for use: <ul style="list-style-type: none"> - Food chain exposure - Sediment or soil ingestion - Dust or aerosol inhalation - Dermal exposure, if an absorption factor has been applied - Presence of dioxin-like, tumor-promoting, or persistent congeners - Early-life exposure (all pathways and mixtures)
LOW RISK AND PERSISTENCE
Upper-bound slope factor: $0.4 \text{ (mg/kg-day)}^{-1}$ Central-estimate slope factor: $0.3 \text{ (mg/kg-day)}^{-1}$
Criteria for use: <ul style="list-style-type: none"> - Ingestion of water-soluble congeners - Inhalation of evaporated congeners - Dermal exposure if no absorption factor has been applied
LOWEST RISK AND PERSISTENCE
Upper-bound slope factor: $0.07 \text{ (mg/kg-day)}^{-1}$ Central-estimate slope factor: $0.04 \text{ (mg/kg-day)}^{-1}$
Criteria for use: Congener or isomer analyses verify that congeners with more than 4 chlorines comprise less than 0.5% of total PCBs.
Notes: (a) - USEPA. 2006. Integrated Risk Information System (IRIS).

TABLE 4-5
 TEFs FOR DIOXIN AND FURAN CONGENERS
 SAUGET AREA 1 CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Constituent	CAS NO.	TEF (a)
Dioxins		
2,3,7,8-TetraCDD	1746-01-6	1
1,2,3,7,8-PentaCDD	40321-76-4	1
1,2,3,4,7,8-HexaCDD	39227-28-6	0.1
1,2,3,6,7,8-HexaCDD	57653-85-7	0.1
1,2,3,7,8,9-HexaCDD	19408-74-3	0.1
1,2,3,4,6,7,8-HeptaCDD	35822-39-4	0.01
OctaCDD	3268-87-9	0.0001
2,3,7,8-PentaCDDs	NA	NA
2,3,7,8-HexaCDDs	NA	NA
2,3,7,8-HeptaCDDs	NA	NA
Furans		
2,3,7,8-TetraCDF	51207-31-9	0.1
1,2,3,7,8-PentaCDF	57117-41-6	0.05
2,3,4,7,8-PentaCDF	57117-31-4	0.5
1,2,3,4,7,8-HexaCDF	70648-26-9	0.1
1,2,3,6,7,8-HexaCDF	57117-44-9	0.1
1,2,3,7,8,9-HexaCDF	72918-21-9	0.1
2,3,4,6,7,8-HexaCDF	60851-34-5	0.1
1,2,3,4,6,7,8-HeptaCDF	67562-39-4	0.01
1,2,3,4,7,8,9-HeptaCDF	55673-89-7	0.01
OctaCDF	39001-02-0	0.0001
2,3,7,8-HexaCDFs	NA	NA
2,3,7,8-HeptaCDFs	NA	NA

Notes:
 CAS - Chemical Abstracts Service.
 CDD- Chorodibenzodioxin
 CDF - Chlorodibenzofuran.
 TEF - Toxicity Equivalency Factor.
 (a) - "Toxic Equivalency Factors for PCBs, PCDDs, PCDFs for Humans and Wildlife."
 Van den Berg, et al.,1998.

TABLE 5-1
 RECEPTOR-AREA MATRIX
 SAUGET AREA 1 CREEK BOTTOM SOILS
 SAUGET AND CAHOKIA, ILLINOIS
 SOUTIA, INC.

<u>Receptor</u> Medium Secondary Medium (Pathways)	Exposure Areas						Total Receptors	
	Fill Area/Sites							
	M (filled lagoon)	CS-B	CS-C	CS-D	CS-E	CS-F		
<u>Recreational Child (RC)</u> Creek Bottom Soils (ing/derm)	(a)	RT-RME-CS-B RT-MLE-CS-B	NA NA	RT-RME-CS-D RT-MLE-CS-D	RT-RME-CS-E RT-MLE-CS-E	RT-RME-CS-F RT-MLE-CS-F	4 4	
<u>Recreational Teen (RT)</u> Creek Bottom Soils (ing/derm)	RT-RME-M RT-MLE-M	RT-RME-CS-B RT-MLE-CS-B	NA NA	RT-RME-CS-D RT-MLE-CS-D	RT-RME-CS-E RT-MLE-CS-E	RT-RME-CS-F RT-MLE-CS-F	5 5	
<u>Construction Worker (CW)</u> Creek Bottom Soils (ing/derm)	CW-RME-M CW-MLE-M	CW-RME-CS-B CW-MLE-CS-B	NA NA	CW-RME-CS-D CW-MLE-CS-D	CW-RME-CS-E CW-MLE-CS-E	CW-RME-CS-F CW-MLE-CS-F	5 5	
Total Receptors	4	6	NA	6	6	6	28	

Notes:

RME - Reasonable Maximum Exposure.

MLE - Most Likely Exposure.

NA - Not applicable; no constituents of potential concern (COPC) identified in this creek segment.

ing - ingestion.

derm - dermal contact.

(a) It was assumed that a recreational child would not access this fenced area.

TABLE 5-2
 SUMMARY OF POTENTIAL EXPOSURE ASSUMPTIONS - RECREATIONAL TEENAGER
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Parameter	RME Recreational Teenager (7 to 18 yrs)	MLE Recreational Teenager (7 to 18 yrs)
Parameters Used in the Dead Creek and Site M Creek Bottom Soils Pathway - Wading		
Exposure Frequency (days/year)	26	(a) 13
Exposure Duration (yr)	11	(b) 11
Soil Ingestion Rate (mg/day)	100	(c) 50
Skin Contacting Medium (cm ²)	3259	(d) 3259
Adherence Factor (mg/cm ²)	0.3	(e) 0.04
Body Weight (kg)	47	(f) 47
Notes:		
MLE - Most Likely Exposure.		
RME - Reasonable Maximum Exposure.		
(a) - 1 day per week for 26 weeks (6 months) of the year.		
(b) - 1 day per 2 weeks for 26 weeks (6 months) of the year.		
(c) - Recreational teenager is assumed to range in age from 7 to 18. Therefore, total exposure duration is 11 years.		
(d) - USEPA, 1991b. Standard Default Exposure Factors.		
(e) - USEPA, 1997a. Exposure Factors Handbook. Average soil ingestion rate for an adult listed in Table 1-2.		
(f) - USEPA, 2004a. Supplemental Guidance for Dermal Risk Assessment. Average 50th percentile surface area of hands (700 cm ²), feet (949 cm ²) and lower legs (1610 cm ²) of males and females aged 7-18 listed in Exhibit C-1.		
(g) - USEPA, 2004a. Supplemental Guidance for Dermal Risk Assessment. Values listed in Exhibit 3-3 (95th percentile for RME, geometric mean for MLE) for soccer players #1 (teens).		
(h) - USEPA, 1997a. Exposure Factors Handbook. Body weight is the average of males and females aged 7-18.		

TABLE 5-3
 SUMMARY OF POTENTIAL EXPOSURE ASSUMPTIONS - RECREATIONAL CHILD
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Parameter	RME Recreational Child (0 to 6 yrs)	MLE Recreational Child (0 to 6 yrs)
Parameters Used in the Creek Bottom Soils Pathway - Wading		
Exposure Frequency (days/year)	26	(a)
Exposure Duration (yr)	6	(c)
Soil Ingestion Rate (mg/day)	200	(d)
Skin Contacting Medium (cm ²)	2800	(f)
Soil on Skin (mg/cm ²)	0.2	(f)
Body Weight (kg)	15	(b)
Notes:		
MLE - Most Likely Exposure.		
RME - Reasonable Maximum Exposure.		
(a) - 1 day per week for 26 weeks (6 months) of the year.		
(b) - 1 day per 2 weeks for 26 weeks (6 months) of the year.		
(c) - Recreational child is assumed to range in age from 0 to 6. Therefore, total exposure duration is 6 years.		
(d) - USEPA, 1991b. Standard Default Exposure Factors.		
(e) - USEPA, 1997a. Exposure Factors Handbook. Average soil ingestion rate for children aged 0 to 6 years, Table 5-23		
(f) - USEPA, 2004a. Risk Assessment Guidance for Superfund. Volume I Part E. Supplemental Guidance for Dermal Risk Assessment. Recommended values for residential child, Exhibit 3-5 for RME and central tendency exposure (i.e., MLE). Assumes surface area of face, hands, forearms, lower legs, and feet are potentially exposed.		

TABLE 5-4
 SUMMARY OF POTENTIAL EXPOSURE ASSUMPTIONS - CONSTRUCTION WORKER
 SAUGET AREA 1 - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Parameter	RME Future Construction/Utility Worker	MLE Future Construction/Utility Worker
Parameters Used in the Dead Creek Bottom Soils Pathway		
Exposure Frequency (days/year)	40	(a)
Exposure Duration (yr)	1	(c)
Soil Ingestion Rate (mg/day)	330	(h)
Skin Contacting Medium (cm ²)	2479	(f)
Soil on Skin (mg/cm ²)	0.3	(g)
Body Weight (kg)	70	(d)
Notes:		
MLE - Most Likely Exposure.		
RME - Reasonable Maximum Exposure.		
(a) - Exposure frequency is equivalent to 5 days per week for 2 months.		
(b) - Exposure frequency is equivalent to five days per week for one month.		
(c) - Construction activities are assumed to occur over a 1 year period.		
(d) - USEPA, 1991b. Standard Default Exposure Factors.		
(e) - ENSR-derived value; described briefly in the text.		
(f) - USEPA, 2004a. Supplemental Guidance for Dermal Risk Assessment. Surface area of hands (904 cm ²), forearms (1173 cm ²), and face (402 cm ²) listed in Exhibit C-1. Represents 50th percentile values, average for males and females.		
(g) - USEPA, 2004a. Supplemental Guidance for Dermal Risk Assessment. Values listed in Exhibit 3-3 (95th percentile for RME, geometric mean for MLE) for construction worker.		
(h) - USEPA. 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites.		

TABLE 5-5
SELECTION OF EXPOSURE POINT CONCENTRATIONS
SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
HUMAN HEALTH RISK ASSESSMENT

Constituent	FOD (a)	Minimum Detect	Maximum Detect	Arithmetic Mean	Location of Max	Data Distribution (b)	UCL Method (c)	UCL (d)	EPC (e)	Units	Value used For EPC?
Creek Segment B											
1,4-Dichlorobenzene	7 : 49 : 49	0.039	5.5	0.29	CBS-CSB-T3-C	Non-parametric	95% Chebyshev (Mean, Sd)	0.813	0.813	mg/kg	UCL
2,3,7,8-TCDD TEQ	49 : 49 : 49	0.00008	0.007	0.0003	CBS-CSB-T0-C	Non-parametric	99% Chebyshev (Mean, Sd)	0.00175	0.00175	mg/kg	UCL
4-Nitroaniline	2 : 49 : 49	0.81	9	0.76	CBS-CSB-T3-E	Non-parametric	Modified-t	1.08	1.08	mg/kg	UCL
Arsenic	49 : 49 : 49	2.7	44	9.72	CBS-CSB-T3-C	Lognormal	H	12.34	12.34	mg/kg	UCL
Benzo(a)anthracene	4 : 49 : 49	0.051	1.9	0.17	CBS-CSB-T0-C	Non-parametric	95% Chebyshev (Mean, Sd)	0.34	0.34	mg/kg	UCL
Benzo(a)pyrene	7 : 49 : 49	0.0425	1.2	0.11	CBS-CSB-T0-C	Non-parametric	95% Chebyshev (Mean, Sd)	0.23	0.23	mg/kg	UCL
Benzo(b)fluoranthene	6 : 49 : 49	0.053	1.4	0.16	CBS-CSB-T0-C	Non-parametric	Modified-t	0.21	0.21	mg/kg	UCL
Bis(2-ethylhexyl)phthalate	5 : 49 : 49	0.065	81	1.77	CBS-CSB-T3-E	Non-parametric	95% Chebyshev (Mean, Sd)	8.96	8.96	mg/kg	UCL
Copper	49 : 49 : 49	6.2	10000	484.20	CBS-CSB-T0-C	Lognormal	95% Chebyshev (MVUE)	1006.78	1006.78	mg/kg	UCL
Dibenzo(a,h)anthracene	3 : 49 : 49	0.18	0.34	0.07	CBS-CSB-T0-C	Non-parametric	Modified-t	0.084	0.084	mg/kg	UCL
Dieldrin	8 : 47 : 49	0.00042	0.049	0.008	CBS-CSB-T17-E	Non-parametric	99% Chebyshev (Mean, Sd)	0.0274	0.0274	mg/kg	UCL
Heptachlor epoxide	14 : 49 : 49	0.0002	0.41	0.01	CBS-CSB-T0-C	Non-parametric	99% Chebyshev (Mean, Sd)	0.099	0.099	mg/kg	UCL
Pentachlorophenol	37 : 49 : 49	0.0019	44	0.99	CBS-CSB-T3-E	Non-parametric	99% Chebyshev (Mean, Sd)	9.91	9.91	mg/kg	UCL
Total PCBs	38 : 49 : 49	0.0467	86.06	2.78	CBS-CSB-T3-E	Non-parametric	99% Chebyshev (Mean, Sd)	21.11	21.11	mg/kg	UCL
Creek Segment D											
Arsenic	6 : 6 : 6	5.7	18	11.40	CBS-CSD-T2-C	Normal	Students-t	15.05	15.05	mg/kg	UCL
Benzo(a)pyrene	3 : 6 : 6	0.049	0.14	0.08	CBS-CSD-T6-C	Gamma	Approximate Gamma	0.129	0.129	mg/kg	UCL
Dieldrin	5 : 6 : 6	0.0013	0.69	0.13	CBS-CSD-T6-C	Gamma	Adjusted Gamma	2.18	0.69	mg/kg	MAX
Total PCBs	5 : 6 : 6	0.0454	2.4396	0.49	CBS-CSD-T6-C	Non-parametric	95% Chebyshev (Mean, Sd)	2.2	2.2	mg/kg	UCL
Creek Segment E											
Arsenic	16 : 17 : 17	2.8	20	8.08	CBS-CSE-T16-C	Gamma	Approximate Gamma	10.21	10.21	mg/kg	UCL
Benzo(a)pyrene	3 : 17 : 17	0.072	0.42	0.09	CBS-CSE-T16-C	Non-parametric	Modified-t	0.13	0.13	mg/kg	UCL
Copper	17 : 17 : 17	24.5	4300	425.21	CBS-CSE-T16-C	Lognormal	95% Chebyshev (MVUE)	864.85	864.85	mg/kg	UCL
Dibenzo(a,h)anthracene	1 : 17 : 17	0.14	0.14	0.07	CBS-CSE-T16-C	Non-parametric	Modified-t	0.078	0.078	mg/kg	UCL
Total PCBs	10 : 17 : 17	0.04605	1.2517	0.19	CBS-CSE-T16-C	Non-parametric	95% Chebyshev (Mean, Sd)	0.55	0.55	mg/kg	UCL
Creek Segment F											
Arsenic	15 : 16 : 16	4.1	19	9.71	CBS-CSF-T5-C	Normal	Students-t	11.38	11.38	mg/kg	UCL
Benzo(a)pyrene	5 : 16 : 16	0.049	0.19	0.07	CBS-CSF-T3-C	Non-parametric	Modified-t	0.085	0.085	mg/kg	UCL
Site M											
1,4-Dichlorobenzene	3 : 9 : 9	0.37	4.1	0.98	SED-M-S10	Gamma	Approximate Gamma	2.49	2.49	mg/kg	UCL
2,3,7,8-TCDD TEQ	9 : 9 : 9	0.00008	0.005	0.00096	SED-M-S10	Gamma	Approximate Gamma	0.002	0.002	mg/kg	UCL
Arsenic	9 : 9 : 9	2.9	25	7.28	SED-M-S7	Gamma	Approximate Gamma	12.22	12.22	mg/kg	UCL
Benzo(a)pyrene	5 : 8 : 9	0.055	0.48	0.21	SED-M-S10	Gamma	Approximate Gamma	0.45	0.45	mg/kg	UCL
Copper	9 : 9 : 9	110	4900	1437.78	SED-M-S10	Gamma	Approximate Gamma	3225.79	3225.79	mg/kg	UCL
Dibenzo(a,h)anthracene	2 : 5 : 9	0.078	0.15	0.08	SED-M-S3	Gamma	Approximate Gamma	0.13	0.13	mg/kg	UCL
Heptachlor	2 : 9 : 9	0.01	0.16	0.03	SED-M-S10	Lognormal	95% Chebyshev (MVUE)	0.057	0.057	mg/kg	UCL
Heptachlor epoxide	3 : 9 : 9	0.012	0.86	0.11	SED-M-S10	Non-parametric	97.5% Chebyshev (Mean, Sd)	0.7	0.7	mg/kg	UCL
Total PCBs	9 : 9 : 9	0.555	27.138	5.40	SED-M-S10	Gamma	Approximate Gamma	13.07	13.07	mg/kg	UCL

Notes:

EPC - Exposure point concentration.

FOD - Frequency of detection.

MAX - Maximum detected concentration.

UCL - Upper confidence level.

(a) Number of samples detected: Number of samples used to calculate statistics: Total number of samples.

(b) Distribution of the data used for the 95% UCL calculation, as provided by the ProUCL software (USEPA, 2004c).

(c) Statistical method used in the calculation of the 95% UCL.

(d) 95% UCL on the arithmetic mean, after duplicates have been averaged and any non detected results with a sample quantitation limit greater than the maximum detected concentration have been excluded. 95% UCLs were calculated in accordance with USEPA, 2002a. Calculating Upper Confidence Limits For Exposure Point Concentrations At Hazardous Waste Sites, OSWER 9285.6-10, using ProUCL (USEPA, 2004c).

(e) The EPC is equal to the lower of the 95% UCL and the maximum detected concentration.

TABLE 5-6
 EXPOSURE POINT CONCENTRATIONS (RME) - CREEK BOTTOM SOILS
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Constituent	CAS	Creek Segment B (mg/kg)	Creek Segment D (mg/kg)	Creek Segment E (mg/kg)	Creek Segment F (mg/kg)	Site M (mg/kg)
1,4-Dichlorobenzene	106-46-7	0.81	--	--	--	2.49
4-Nitroaniline	100-01-6	1.08	--	--	--	--
Arsenic	7440-38-2	12.34	15.05	10.21	11.38	12.22
Benzo(a)anthracene	56-55-3	0.34	--	--	--	--
Benzo(a)pyrene	50-32-8	0.23	0.13	0.13	0.09	0.45
Benzo(b)fluoranthene	205-99-2	0.21	--	--	--	--
Bis(2-ethylhexyl)phthalate	117-81-7	8.96	--	--	--	--
Copper	7440-50-8	1006.78	--	864.85	--	3225.79
Dibenzo(a,h)anthracene	53-70-3	0.08	--	0.08	--	0.13
Dieldrin	60-57-1	0.03	0.69	--	--	--
Heptachlor	76-44-8	--	--	--	--	0.06
Heptachlor epoxide	1024-57-3	0.1	--	--	--	0.7
Pentachlorophenol	87-86-5	9.91	--	--	--	--
2,3,7,8-TCDD TEQ	1746-01-6	0.00175	--	--	--	0.002
Total PCBs	1336-36-3	21.11	2.2	0.55	--	13.07
Notes:						
-- - Not a COPC in this area/medium.						
CAS - Chemical Abstracts Service.						
COPC - Constituent of Potential Concern.						
EPC - Exposure Point Concentration.						
RME - Reasonable Maximum Exposure.						

TABLE 5-7
 EXPOSURE POINT CONCENTRATIONS (MLE) - CREEK BOTTOM SOILS
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Constituent	CAS	Creek Segment B (mg/kg)	Creek Segment D (mg/kg)	Creek Segment E (mg/kg)	Creek Segment F (mg/kg)	Site M (mg/kg)
1,4-Dichlorobenzene	106-46-7	0.29	--	--	--	0.98
4-Nitroaniline	100-01-6	0.76	--	--	--	--
Arsenic	7440-38-2	9.72	11.40	8.08	9.71	7.28
Benzo(a)anthracene	56-55-3	0.17	--	--	--	--
Benzo(a)pyrene	50-32-8	0.11	0.08	0.09	0.07	0.21
Benzo(b)fluoranthene	205-99-2	0.16	--	--	--	--
Bis(2-ethylhexyl)phthalate	117-81-7	1.77	--	--	--	--
Copper	7440-50-8	484.20	--	425.21	--	1437.78
Dibenzo(a,h)anthracene	53-70-3	0.07	--	0.07	--	0.08
Dieldrin	60-57-1	0.008	0.13	--	--	--
Heptachlor	76-44-8	--	--	--	--	0.03
Heptachlor epoxide	1024-57-3	0.01	--	--	--	0.11
Pentachlorophenol	87-86-5	0.99	--	--	--	--
2,3,7,8-TCDD TEQ	1746-01-6	0.0003	--	--	--	0.00096
Total PCBs	1336-36-3	2.78	0.49	0.19	--	5.40
Notes:						
-- - Not a COPC in this area/medium.						
CAS - Chemical Abstracts Service.						
COPC - Constituent of Potential Concern.						
EPC - Exposure Point Concentration.						
MLE - Most Likely Exposure.						

TABLE 6-1
 TOTAL POTENTIAL CARCINOGENIC RISK
 RECREATIONAL TEEN
 SAUGET AREA 1 - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Constituent	RME					MLE				
	Creek Segment B	Creek Segment D	Creek Segment E	Creek Segment F	SITE M	Creek Segment B	Creek Segment D	Creek Segment E	Creek Segment F	SITE M
1,4-Dichlorobenzene	4.96E-10	NC	NC	NC	1.52E-09	2.83E-11	NC	NC	NC	9.56E-11
4-Nitroaniline	1.07E-09	NC	NC	NC	NC	1.20E-10	NC	NC	NC	NC
Arsenic	2.62E-07	3.19E-07	2.16E-07	2.41E-07	2.59E-07	3.28E-08	3.85E-08	2.73E-08	3.28E-08	2.46E-08
Benzo(a)anthracene	9.23E-09	NC	NC	NC	NC	4.65E-10	NC	NC	NC	NC
Benzo(a)pyrene	6.24E-08	3.53E-08	3.53E-08	2.44E-08	1.22E-07	3.01E-09	2.19E-09	2.46E-09	1.90E-09	5.74E-09
Benzo(b)fluoranthene	5.70E-09	NC	NC	NC	NC	4.37E-10	NC	NC	NC	NC
Bis(2-ethylhexyl)phthalate	5.91E-09	NC	NC	NC	NC	1.86E-10	NC	NC	NC	NC
Copper	NC									
Dibenz(a,h)anthracene	2.17E-08	NC	2.17E-08	NC	3.53E-08	1.91E-09	NC	1.91E-09	NC	2.19E-09
Dieldrin	2.26E-08	5.20E-07	NC	NC	NC	9.61E-10	1.56E-08	NC	NC	NC
Heptachlor	NC	NC	NC	NC	1.27E-08	NC	NC	NC	NC	1.01E-09
Heptachlor epoxide	4.29E-08	NC	NC	NC	3.00E-07	6.83E-10	NC	NC	NC	7.51E-09
Pentachlorophenol	9.75E-08	NC	NC	NC	NC	1.17E-09	NC	NC	NC	NC
2,3,7,8-TCDD TEQ	4.96E-06	NC	NC	NC	5.67E-06	1.55E-07	NC	NC	NC	4.96E-07
Total PCBs	2.21E-06	2.30E-07	5.76E-08	NC	1.37E-06	3.96E-08	6.97E-09	2.70E-09	NC	7.68E-08
Total Risk	7.70E-06	1.10E-06	3.31E-07	2.66E-07	7.77E-06	2.36E-07	6.33E-08	3.44E-08	3.47E-08	6.14E-07

Notes:

MLE - Most Likely Exposure.

NC - Not Calculated, no dose-response value or not a constituent of potential concern in this area.

RME - Reasonable Maximum Exposure.

TABLE 6-2
 TOTAL POTENTIAL HAZARD INDEX
 RECREATIONAL TEEN
 SAUGET AREA 1 - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Constituent	RME					MLE				
	Creek Segment B	Creek Segment D	Creek Segment E	Creek Segment F	SITE M	Creek Segment B	Creek Segment D	Creek Segment E	Creek Segment F	SITE M
1,4-Dichlorobenzene	1.01E-04	NC	NC	NC	3.11E-04	5.77E-06	NC	NC	NC	1.95E-05
4-Nitroaniline	1.08E-04	NC	NC	NC	NC	1.21E-05	NC	NC	NC	NC
Arsenic	3.70E-03	4.51E-03	3.06E-03	3.41E-03	3.66E-03	4.64E-04	5.45E-04	3.86E-04	4.64E-04	3.48E-04
Benzo(a)anthracene	NC									
Benzo(a)pyrene	NC									
Benzo(b)fluoranthene	NC									
Bis(2-ethylhexyl)phthalate	1.34E-04	NC	NC	NC	NC	4.23E-06	NC	NC	NC	NC
Copper	4.44E-02	NC	3.82E-02	NC	1.42E-01	1.79E-03	NC	1.57E-03	NC	5.31E-03
Dibenzo(a,h)anthracene	NC									
Dieldrin	1.80E-04	4.14E-03	NC	NC	NC	7.64E-06	1.24E-04	NC	NC	NC
Heptachlor	NC	NC	NC	NC	3.60E-05	NC	NC	NC	NC	2.87E-06
Heptachlor epoxide	2.31E-03	NC	NC	NC	1.61E-02	3.67E-05	NC	NC	NC	4.04E-04
Pentachlorophenol	1.72E-04	NC	NC	NC	NC	2.07E-06	NC	NC	NC	NC
2,3,7,8-TCDD TEQ	2.10E-01	NC	NC	NC	2.40E-01	6.57E-03	NC	NC	NC	2.10E-02
Total PCBs	3.52E-01	3.67E-02	9.16E-03	NC	2.18E-01	6.29E-03	1.11E-03	4.30E-04	NC	1.22E-02
Total HI	6.13E-01	4.53E-02	5.04E-02	3.41E-03	6.21E-01	1.52E-02	1.78E-03	2.39E-03	4.64E-04	3.93E-02

Notes:

HI - Hazard Index.

MLE - Most Likely Exposure.

NC - Not Calculated, no dose-response value or not a constituent of potential concern in this area.

RME - Reasonable Maximum Exposure.

TABLE 6-3
 TOTAL POTENTIAL CARCINOGENIC RISK
 RECREATIONAL CHILD
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Constituent	RME				MLE			
	Creek Segment B	Creek Segment D	Creek Segment E	Creek Segment F	Creek Segment B	Creek Segment D	Creek Segment E	Creek Segment F
1,4-Dichlorobenzene	1.10E-09	NC	NC	NC	8.53E-11	NC	NC	NC
4-Nitroaniline	2.36E-09	NC	NC	NC	3.61E-10	NC	NC	NC
Arsenic	5.79E-07	7.06E-07	4.79E-07	5.34E-07	9.90E-08	1.16E-07	8.23E-08	9.89E-08
Benzo(a)anthracene	1.32E-08	NC	NC	NC	1.10E-09	NC	NC	NC
Benzo(a)pyrene	8.94E-08	5.05E-08	5.05E-08	3.50E-08	7.12E-09	5.18E-09	5.82E-09	4.50E-09
Benzo(b)fluoranthene	8.16E-09	NC	NC	NC	1.04E-09	NC	NC	NC
Bis(2-ethylhexyl)phthalate	1.31E-08	NC	NC	NC	5.61E-10	NC	NC	NC
Copper	NC							
Dibenzo(a,h)anthracene	3.11E-08	NC	3.11E-08	NC	4.53E-09	NC	4.53E-09	NC
Dieldrin	5.00E-08	1.15E-06	NC	NC	2.90E-09	4.71E-08	NC	NC
Heptachlor	NC							
Heptachlor epoxide	9.48E-08	NC	NC	NC	2.06E-09	NC	NC	NC
Pentachlorophenol	1.65E-07	NC	NC	NC	3.09E-09	NC	NC	NC
2,3,7,8-TCDD TEQ	1.25E-05	NC	NC	NC	4.89E-07	NC	NC	NC
Total PCBs	4.20E-06	4.38E-07	1.09E-07	NC	1.12E-07	1.97E-08	7.63E-09	NC
Total Risk	1.77E-05	2.34E-06	6.70E-07	5.69E-07	7.22E-07	1.88E-07	1.00E-07	1.03E-07

Notes:
 MLE - Most Likely Exposure.
 NC - Not Calculated, no dose-response value or not a constituent of potential concern in this area.
 RME - Reasonable Maximum Exposure.

TABLE 6-4
 TOTAL POTENTIAL HAZARD INDEX
 RECREATIONAL CHILD
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Constituent	RME				MLE			
	Creek Segment B	Creek Segment D	Creek Segment E	Creek Segment F	Creek Segment B	Creek Segment D	Creek Segment E	Creek Segment F
1,4-Dichlorobenzene	4.10E-04	NC	NC	NC	3.19E-05	NC	NC	NC
4-Nitroaniline	4.38E-04	NC	NC	NC	6.69E-05	NC	NC	NC
Arsenic	1.50E-02	1.83E-02	1.24E-02	1.38E-02	2.57E-03	3.01E-03	2.13E-03	2.56E-03
Benzo(a)anthracene	NC							
Benzo(a)pyrene	NC							
Benzo(b)fluoranthene	NC							
Bis(2-ethylhexyl)phthalate	5.45E-04	NC	NC	NC	2.34E-05	NC	NC	NC
Copper	9.82E-02	NC	8.44E-02	NC	6.59E-03	NC	5.78E-03	NC
Dibenzo(a,h)anthracene	NC							
Dieldrin	7.29E-04	1.68E-02	NC	NC	4.22E-05	6.86E-04	NC	NC
Heptachlor	NC							
Heptachlor epoxide	9.35E-03	NC	NC	NC	2.03E-04	NC	NC	NC
Pentachlorophenol	5.33E-04	NC	NC	NC	1.00E-05	NC	NC	NC
2,3,7,8-TCDD TEQ	9.71E-01	NC	NC	NC	3.80E-02	NC	NC	NC
Total PCBs	1.23E+00	1.28E-01	3.19E-02	NC	3.26E-02	5.74E-03	2.23E-03	NC
Total HI	2.32E+00	1.63E-01	1.29E-01	1.38E-02	8.01E-02	9.44E-03	1.01E-02	2.56E-03
Total PCBs (Post-Excavation(a))	8.70E-03	--	--	--	--	--	--	--
Notes:								
(a) - Potential HI calculated for PCBs in Creek Segment B using sample data remaining after excavation as well as post-excavation data.								
HI - Hazard Index.								
MLE - Most Likely Exposure.								
NC - Not Calculated, no dose-response value or not a constituent of potential concern in this area.								
RME - Reasonable Maximum Exposure.								

TABLE 6-5
 TOTAL POTENTIAL CARCINOGENIC RISK
 CONSTRUCTION WORKER
 SAUGET AREA 1 - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Constituent	RME					MLE				
	Creek Segment B	Creek Segment D	Creek Segment E	Creek Segment F	SITE M	Creek Segment B	Creek Segment D	Creek Segment E	Creek Segment F	SITE M
1,4-Dichlorobenzene	9.52E-11	NC	NC	NC	2.93E-10	3.74E-12	NC	NC	NC	1.26E-11
4-Nitroaniline	2.05E-10	NC	NC	NC	NC	1.58E-11	NC	NC	NC	NC
Arsenic	5.02E-08	6.12E-08	4.16E-08	4.63E-08	4.97E-08	4.34E-09	5.09E-09	3.61E-09	4.34E-09	3.25E-09
Benzo(a)anthracene	1.07E-09	NC	NC	NC	NC	7.05E-11	NC	NC	NC	NC
Benzo(a)pyrene	7.22E-09	4.08E-09	4.08E-09	2.83E-09	1.41E-08	4.56E-10	3.32E-10	3.73E-10	2.88E-10	8.71E-10
Benzo(b)fluoranthene	6.60E-10	NC	NC	NC	NC	6.63E-11	NC	NC	NC	NC
Bis(2-ethylhexyl)phthalate	1.13E-09	NC	NC	NC	NC	2.46E-11	NC	NC	NC	NC
Copper	NC									
Dibenzo(a,h)anthracene	2.51E-09	NC	2.51E-09	NC	4.08E-09	2.90E-10	NC	2.90E-10	NC	3.32E-10
Dieldrin	4.34E-09	9.98E-08	NC	NC	NC	1.27E-10	2.07E-09	NC	NC	NC
Heptachlor	NC	NC	NC	NC	2.44E-09	NC	NC	NC	NC	1.34E-10
Heptachlor epoxide	8.23E-09	NC	NC	NC	5.76E-08	9.04E-11	NC	NC	NC	9.94E-10
Pentachlorophenol	1.37E-08	NC	NC	NC	NC	1.67E-10	NC	NC	NC	NC
2,3,7,8-TCDD TEQ	1.10E-06	NC	NC	NC	1.26E-06	1.98E-08	NC	NC	NC	6.35E-08
Total PCBs	3.57E-07	3.72E-08	9.30E-09	NC	2.21E-07	5.46E-09	9.62E-10	3.73E-10	NC	1.06E-08
Total Risk	1.55E-06	2.02E-07	5.74E-08	4.91E-08	1.61E-06	3.10E-08	8.45E-09	4.65E-09	4.63E-09	7.97E-08

Notes:

MLE - Most Likely Exposure.

NC - Not Calculated, no dose-response value or not a constituent of potential concern in this area.

RME - Reasonable Maximum Exposure.

TABLE 6-6
 TOTAL POTENTIAL HAZARD INDEX
 CONSTRUCTION WORKER
 SAUGET AREA 1 - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Constituent	RME					MLE				
	Creek Segment B	Creek Segment D	Creek Segment E	Creek Segment F	SITE M	Creek Segment B	Creek Segment D	Creek Segment E	Creek Segment F	SITE M
1,4-Dichlorobenzene	2.14E-04	NC	NC	NC	6.57E-04	8.40E-06	NC	NC	NC	2.84E-05
4-Nitroaniline	2.28E-04	NC	NC	NC	NC	1.76E-05	NC	NC	NC	NC
Arsenic	7.81E-03	9.53E-03	6.46E-03	7.20E-03	7.74E-03	6.76E-04	7.92E-04	5.62E-04	6.75E-04	5.06E-04
Benzo(a)anthracene	NC									
Benzo(a)pyrene	NC									
Benzo(b)fluoranthene	NC									
Bis(2-ethylhexyl)phthalate	2.84E-04	NC	NC	NC	NC	6.15E-06	NC	NC	NC	NC
Copper	4.57E-02	NC	3.93E-02	NC	1.47E-01	3.20E-03	NC	2.81E-03	NC	9.49E-03
Dibenzo(a,h)anthracene	NC									
Dieldrin	3.80E-04	8.74E-03	NC	NC	NC	1.11E-05	1.81E-04	NC	NC	NC
Heptachlor	NC	NC	NC	NC	7.60E-05	NC	NC	NC	NC	4.17E-06
Heptachlor epoxide	4.87E-03	NC	NC	NC	3.41E-02	5.35E-05	NC	NC	NC	5.88E-04
Pentachlorophenol	2.67E-04	NC	NC	NC	NC	3.25E-06	NC	NC	NC	NC
2,3,7,8-TCDD TEQ	5.13E-01	NC	NC	NC	5.86E-01	9.26E-03	NC	NC	NC	2.96E-02
Total PCBs (a)	6.25E-01	6.51E-02	1.63E-02	NC	3.87E-01	9.56E-03	1.68E-03	6.53E-04	NC	1.86E-02
Total HI	1.20E+00	8.34E-02	6.20E-02	7.20E-03	1.16E+00	2.28E-02	2.66E-03	4.02E-03	6.75E-04	5.88E-02

Notes:
 (a) - Creek Segment B HI is below one on a target endpoint basis (See Section 6.3.3). Additionally, excavation has reduced PCB concentrations and a liner will be installed.
 HI - Hazard Index.
 MLE - Most Likely Exposure.
 NC - Not Calculated, no dose-response value or not a constituent of potential concern in this area.
 RME - Reasonable Maximum Exposure.

TABLE 7-1
 SUMMARY OF POTENTIAL RISK AND HAZARD INDICES - RECREATIONAL TEENAGER
 SAUGET AREA 1 - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Area (a)	Potential Risk		Hazard Index	
	RME	MLE	RME	MLE
Creek Segment B	7.70E-06	2.36E-07	6.13E-01	1.52E-02
Creek Segment D	1.10E-06	6.33E-08	4.53E-02	1.78E-03
Creek Segment E	3.31E-07	3.44E-08	5.04E-02	2.39E-03
Creek Segment F	2.66E-07	3.47E-08	3.41E-03	4.64E-04
Site M	7.77E-06	6.14E-07	6.21E-01	3.93E-02

Notes:
 MLE - Maximum Likely Exposure.
 RME - Reasonable Maximum Exposure.
 (a) No COPCs identified for Creek Segment C.

TABLE 7-2
 SUMMARY OF POTENTIAL RISK AND HAZARD INDICES - RECREATIONAL CHILD
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Area (a)	Potential Risk		Hazard Index	
	RME	MLE	RME	MLE
Creek Segment B (Pre-Excavation)	1.77E-05	7.22E-07	2.32E+00 (c)	8.01E-02
Creek Segment D	2.34E-06	1.88E-07	1.63E-01	9.44E-03
Creek Segment E	6.70E-07	1.00E-07	1.29E-01	1.01E-02
Creek Segment F	5.69E-07	1.03E-07	1.38E-02	2.56E-03

Notes:

MLE - Maximum Likely Exposure.
 RME - Reasonable Maximum Exposure.
 (a) - No COPCs identified for Creek Segment C.
 (b) - Recreational child assumed not to access to Site M, which is fenced.
 (c) - Based on target endpoint analysis and evaluation of HI using post-excavation data, HI is below one.

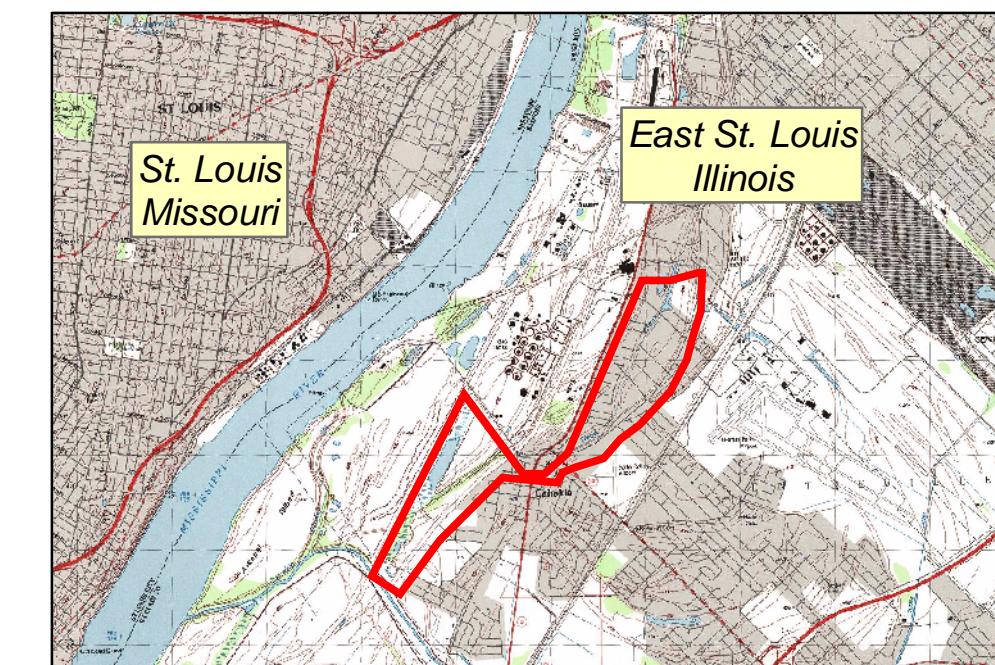
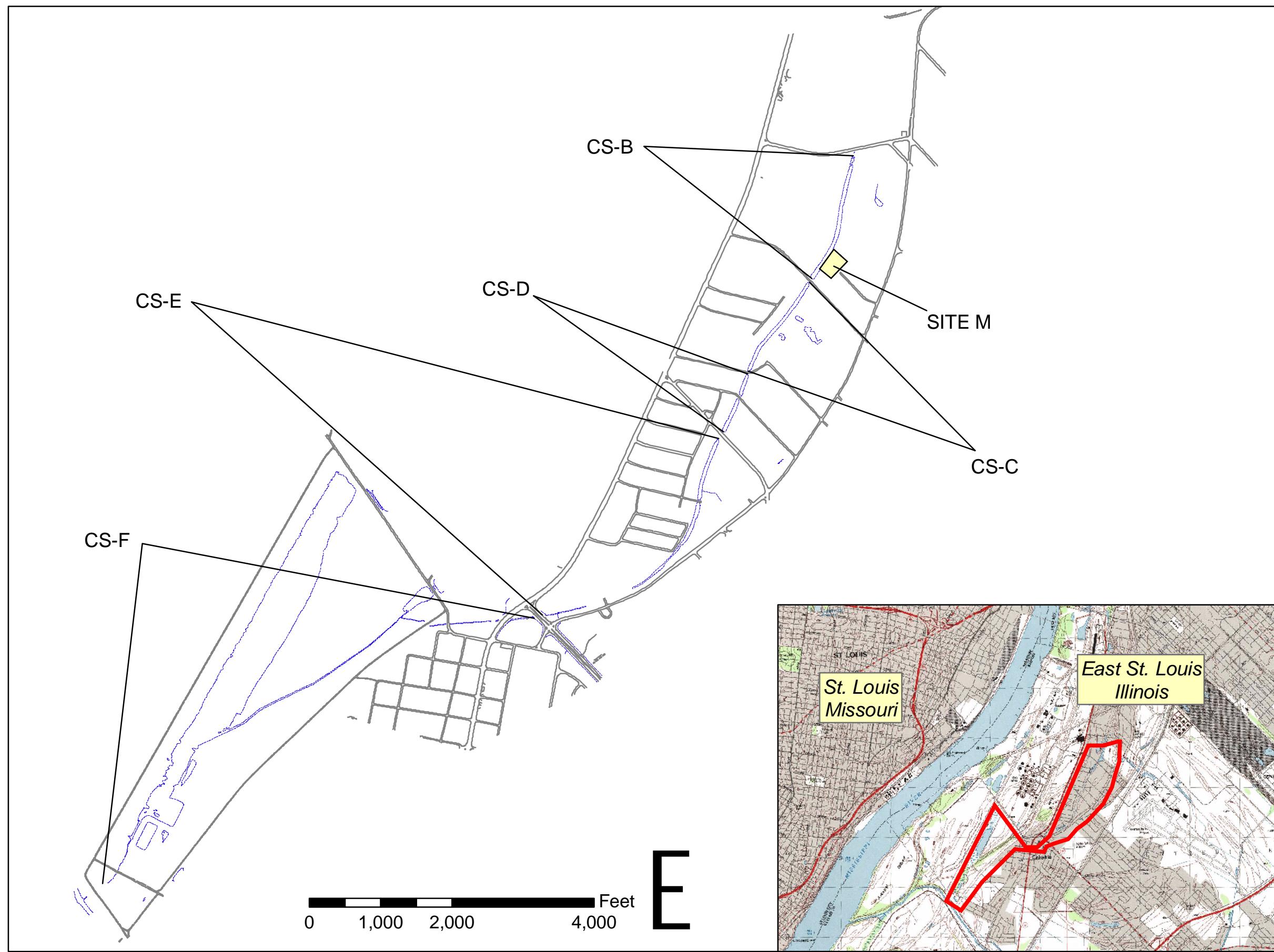
TABLE 7-3
 SUMMARY OF POTENTIAL RISK AND HAZARD INDICES - CONSTRUCTION WORKER
 SAUGET AREA 1 - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Area (a)	Potential Risk		Hazard Index	
	RME	MLE	RME	MLE
Creek Segment B	1.55E-06	3.10E-08	1.20E+00 (b)	2.28E-02
Creek Segment D	2.02E-07	8.45E-09	8.34E-02	2.66E-03
Creek Segment E	5.74E-08	4.65E-09	6.20E-02	4.02E-03
Creek Segment F	4.91E-08	4.63E-09	7.20E-03	6.75E-04
Site M	1.61E-06	7.97E-08	1.16E+00	5.88E-02

Notes:
 MLE - Maximum Likely Exposure.
 RME - Reasonable Maximum Exposure.
 (a) - No COPCs identified for Creek Segment C.
 (b) - HI is below one on a target endpoint basis (See Section 6.3.3). Additionally, excavation has reduced PCB concentrations and a liner will be installed.

Sauget Area 1
Creek Bottom Soils
Human Health Risk Assessment

FIGURE 1-1
Sauget Area 1 Study Area



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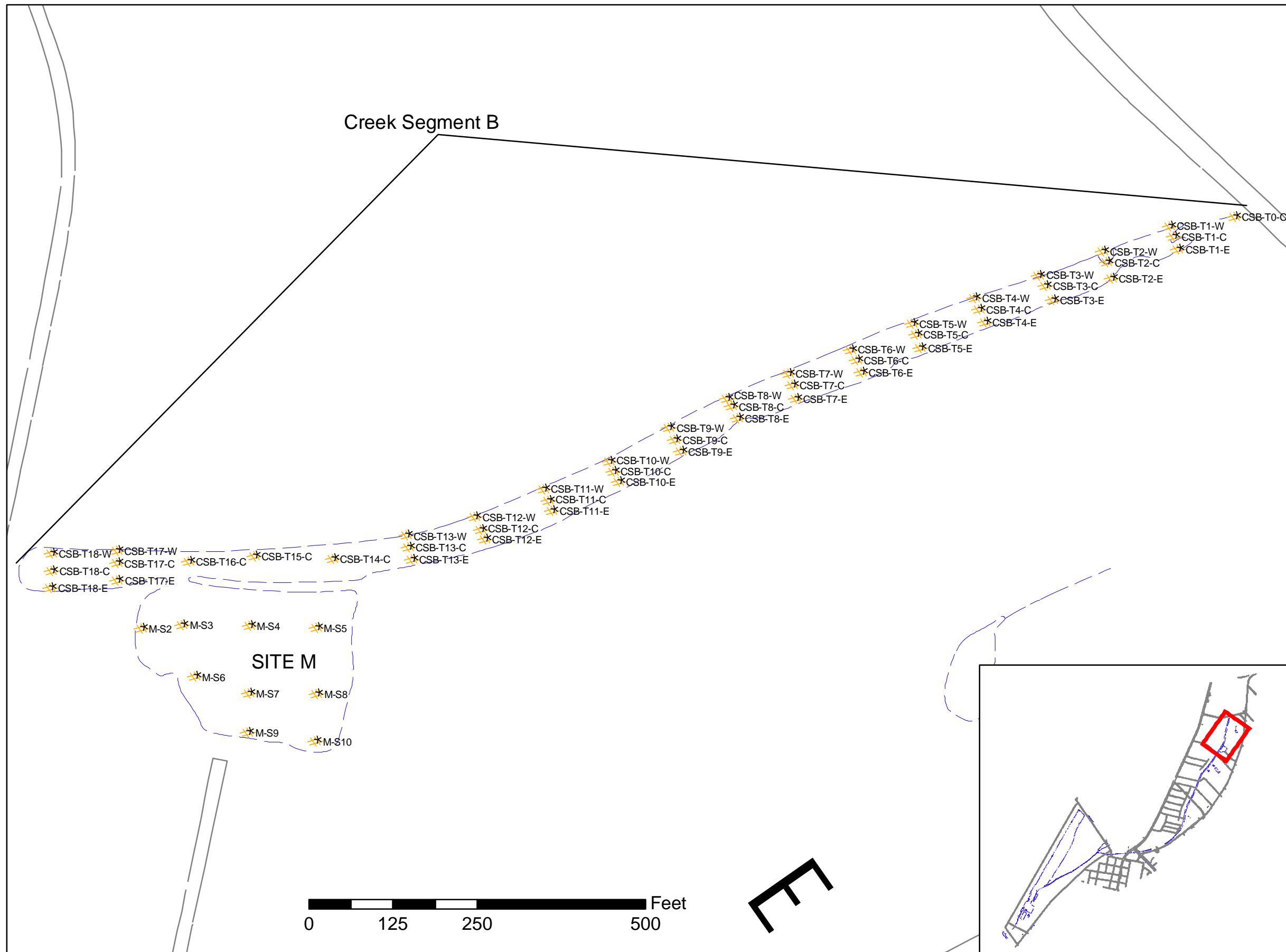
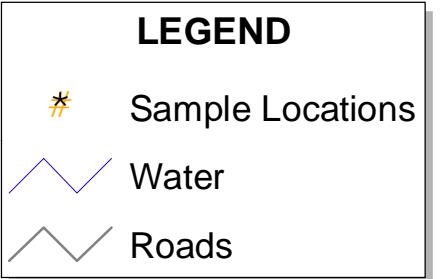


FIGURE 3-1
Sauget Area 1
Creek Bottom Soils
Sample Locations

Sheet 1 of 3



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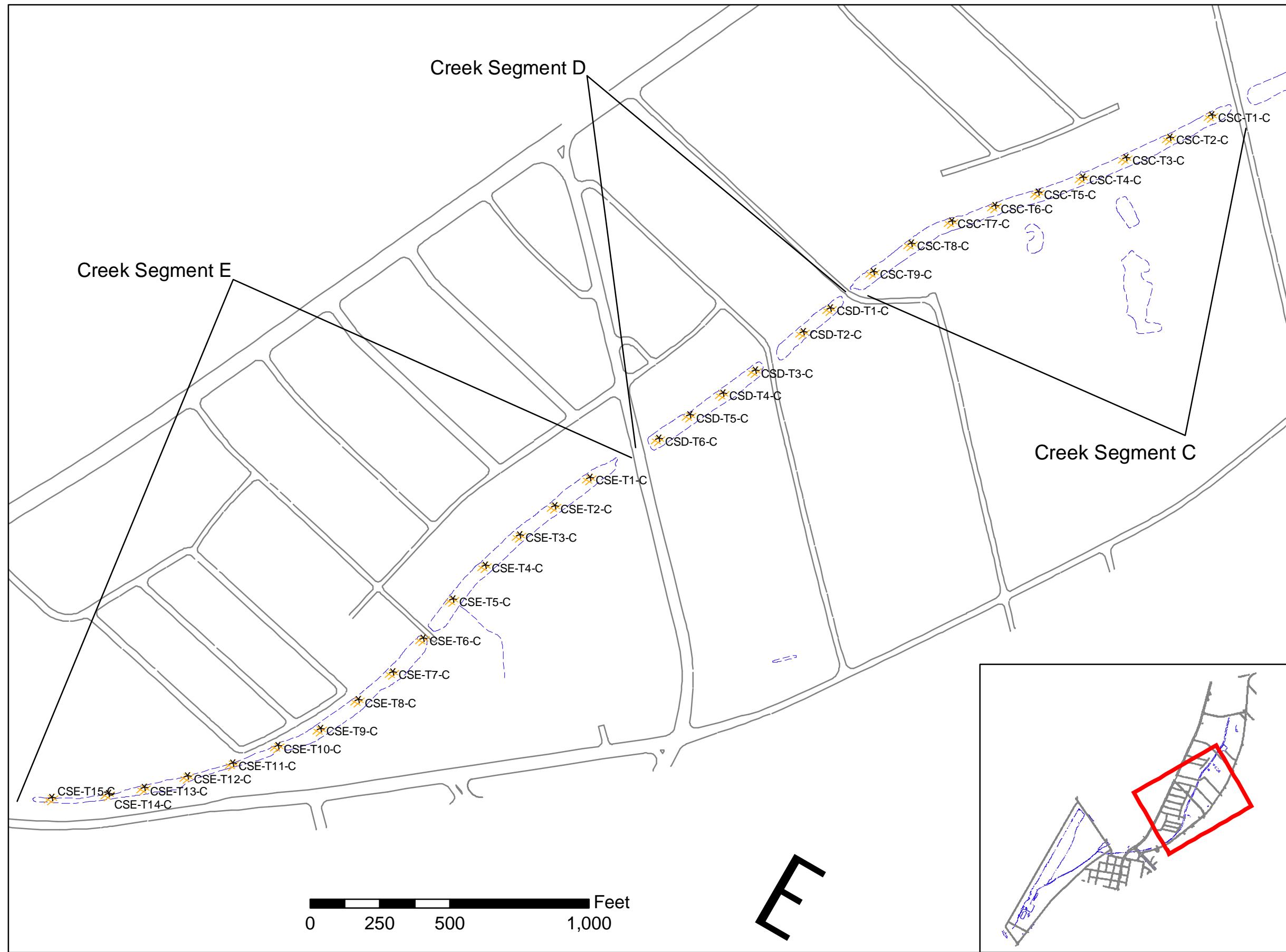


FIGURE 3-1 (cont.)

Sauget Area 1
Creek Bottom Soils
Sample Locations

Sheet 2 of 3

LEGEND

- * Sample Locations
- Water
- Roads

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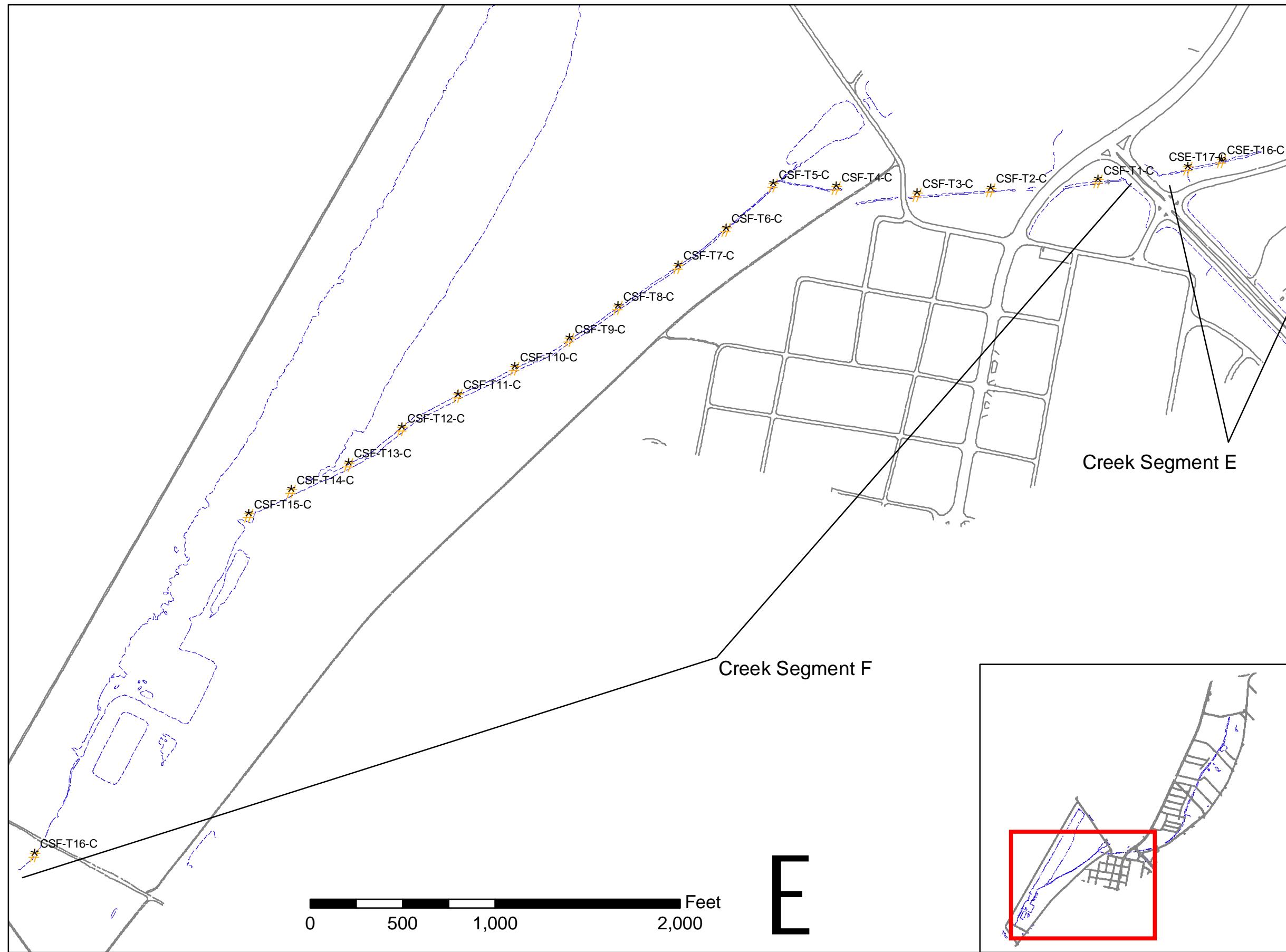
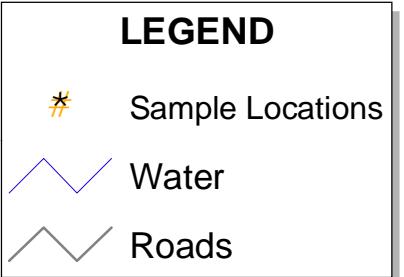


FIGURE 3-1 (cont.)

Sauget Area 1
Creek Bottom Soils
Sample Locations

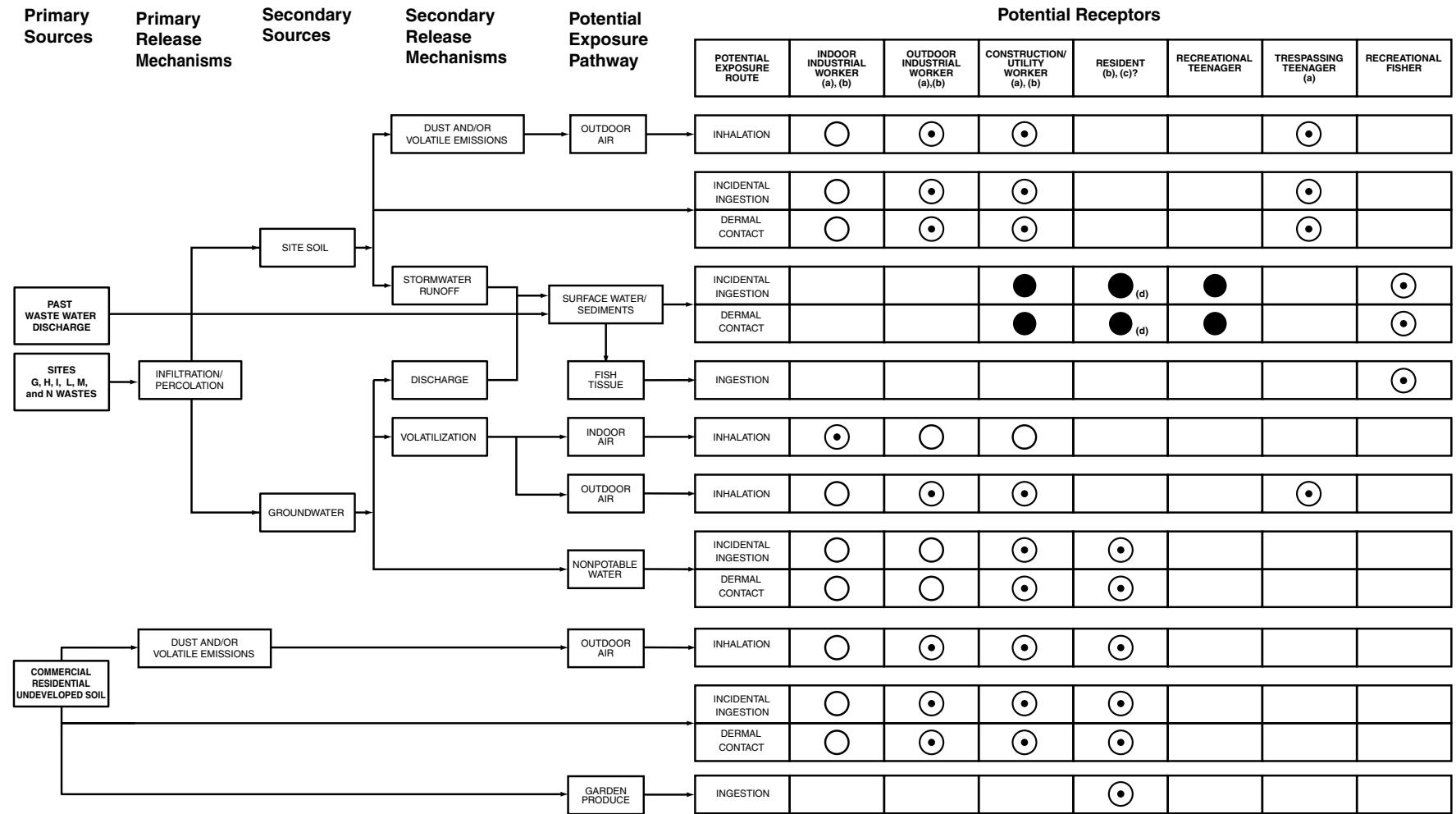
Sheet 3 of 3



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Key:

Pathway potentially complete, further evaluation recommended

- (a) Sites
- (b) Residential, commercial, undeveloped areas

Pathway evaluated and found incomplete or insignificant, no further evaluation recommended

- (c) Fill Area N will be evaluated for potential residential receptors
- (d) Evaluated as the recreational child

Pathway evaluated in the Saugat Area 1 Human Health Risk Assessment (Solutia, 2001)

Boxes without circles indicate that pathway is not applicable to that receptor

Figure 5-1
Conceptual Site Model for
Human Health Risk Assessment
Saugat Area 1 Creek Bottom Soils,
Saugat and Cahokia, Illinois Solutia, Inc.

Attachment A

Photographs of Creek Segments B-F



Creek Segment B



Creek Segment B



Creek Segment C



Creek Segment C



Creek Segment D



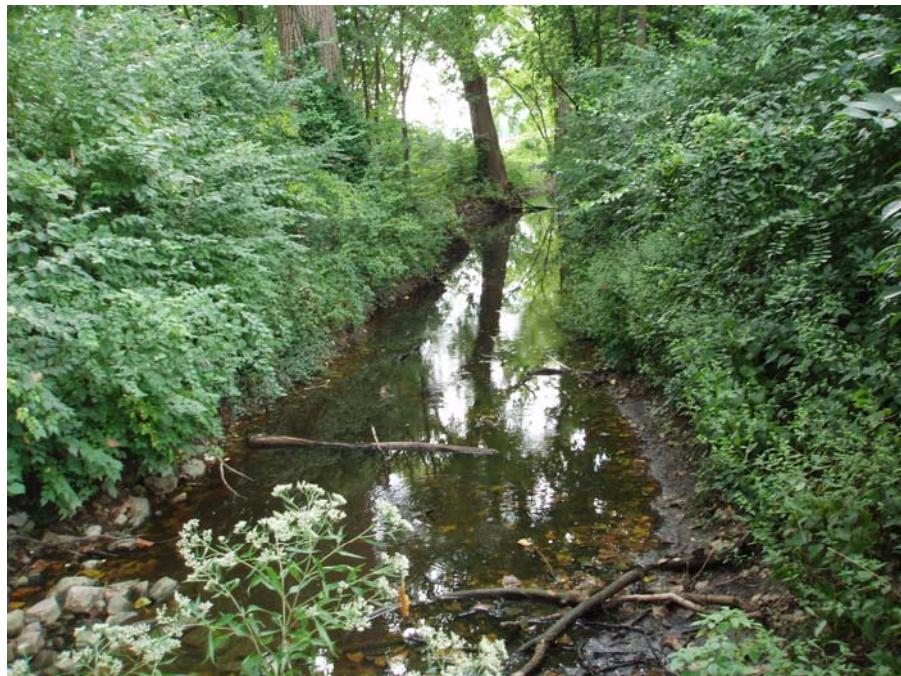
Creek Segment D



Creek Segment D



Creek Segment E



Creek Segment E



Creek Segment E



Creek Segment E



Creek Segment E



Creek Segment F



Creek Segment F

Attachment B

Summary Statistics and Calculation of Total PCBs and TCDD-TEQ

TABLE B-1
 SUMMARY STATISTICS CREEK BOTTOM SOILS
 SAUGET AREA 1 EE/CA AND RI/FS ADDENDUM - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Chemical	Cas rn	Units	Frequency of Detection	Minimum	Maximum Detect	Arithmetic Mean
Creek Segment B						
1,1,1-Trichloroethane	71-55-6	mg/kg	3 : 48 : 49	0.0038	0.0230	0.0042
1,2,4-Trichlorobenzene	120-82-1	mg/kg	6 : 49 : 49	0.04	80.0000	2.2752
1,2-Dichlorobenzene	95-50-1	mg/kg	6 : 49 : 49	0.057	53.0000	1.6710
1,2-Dichloroethene (total)	540-59-0	mg/kg	1 : 48 : 49	0.012	0.0120	0.0039
1,3-Dichlorobenzene	541-73-1	mg/kg	1 : 4 : 49	0.1	0.1000	0.1000
1,4-Dichlorobenzene	106-46-7	mg/kg	7 : 49 : 49	0.039	5.5000	0.2931
2,3,7,8-TCDD-TEQ	1746-01-6	mg/kg	49 : 49 : 49	0.000008384	0.0066	0.0003
2,4,5-T	93-76-5	mg/kg	12 : 48 : 49	0.002	0.6100	0.0220
2,4,5-TP (Silvex)	93-72-1	mg/kg	3 : 3 : 49	0.0014	0.0020	0.0018
2,4,5-Trichlorophenol	95-95-4	mg/kg	1 : 49 : 49	0.24	0.2400	0.1199
2,4,6-Trichlorophenol	88-06-2	mg/kg	5 : 49 : 49	0.065	4.3000	0.1580
2,4-D	94-75-7	mg/kg	3 : 47 : 49	0.017	0.1400	0.0091
2,4-DB	94-82-6	mg/kg	2 : 47 : 49	0.036	0.0570	0.0076
2,4-Dichlorophenol	120-83-2	mg/kg	5 : 49 : 49	0.069	6.6000	0.2692
2-Butanone (MEK)	78-93-3	mg/kg	29 : 48 : 49	0.0052	0.6100	0.0350
2-Chlorophenol	95-57-8	mg/kg	3 : 49 : 49	0.097	0.5100	0.1246
2-Hexanone	591-78-6	mg/kg	1 : 48 : 49	0.077	0.0770	0.0198
2-MethylNaphthalene	91-57-6	mg/kg	3 : 49 : 49	0.4	7.3000	0.3531
3&4Methylphenol	106-44-5	mg/kg	1 : 49 : 49	1.6	1.6000	0.1477
4,4'-DDD	72-54-8	mg/kg	3 : 49 : 49	0.00083	0.4700	0.0160
4,4'-DDE	72-55-9	mg/kg	2 : 44 : 49	0.004	0.0350	0.0036
4,4'-DDT	50-29-3	mg/kg	15 : 48 : 48	0.00096	0.1600	0.0183
4-Chloroaniline	106-47-8	mg/kg	5 : 49 : 49	0.076	11.0000	0.5942
4-Methyl-2-pentanone (MIBK)	108-10-1	mg/kg	5 : 48 : 49	0.0093	0.1100	0.0203
4-Nitroaniline	100-01-6	mg/kg	2 : 49 : 49	0.81	9.0000	0.7588
4-Nitrophenol	100-02-7	mg/kg	1 : 1 : 49	0.44	0.4400	0.4400
Acenaphthene	83-32-9	mg/kg	2 : 49 : 49	0.062	0.8600	0.1317
Acenaphthylene	208-96-8	mg/kg	1 : 49 : 49	0.24	0.2400	0.1203
Acetone	67-64-1	mg/kg	38 : 48 : 49	0.011	0.4700	0.1159
Aldrin	309-00-2	mg/kg	1 : 1 : 49	0.00036	0.0004	0.0004
alpha-BHC	319-84-6	mg/kg	9 : 44 : 49	0.000087	0.0029	0.0006
Aluminum	7429-90-5	mg/kg	49 : 49 : 49	1200	20000.0000	9348.9796
Anthracene	120-12-7	mg/kg	4 : 49 : 49	0.042	1.4000	0.1477
Antimony	7440-36-0	mg/kg	4 : 46 : 49	0.71	3.9000	1.4480
Arsenic	7440-38-2	mg/kg	49 : 49 : 49	2.7	44.0000	9.7194
Barium	7440-39-3	mg/kg	49 : 49 : 49	99	1500.0000	298.1429
Benzene	71-43-2	mg/kg	19 : 49 : 49	0.0024	0.1800	0.0083
Benzo(a)anthracene	56-55-3	mg/kg	4 : 49 : 49	0.051	1.9000	0.1693
Benzo(a)pyrene	50-32-8	mg/kg	7 : 49 : 49	0.0425	1.2000	0.1089
Benzo(b)fluoranthene	205-99-2	mg/kg	6 : 49 : 49	0.053	1.4000	0.1557
Benzo(g,h,i)perylene	191-24-2	mg/kg	6 : 49 : 49	0.078	0.8900	0.1379
Benzo(k)fluoranthene	207-08-9	mg/kg	5 : 49 : 49	0.058	0.9000	0.1487
Beryllium	7440-41-7	mg/kg	36 : 49 : 49	0.19	1.3000	0.5386
beta-BHC	319-85-7	mg/kg	10 : 46 : 49	0.00057	0.0077	0.0013
Bis(2-ethylhexyl)phthalate	117-81-7	mg/kg	5 : 49 : 49	0.065	81.0000	1.7665
Butylbenzylphthalate	85-68-7	mg/kg	2 : 49 : 49	0.082	3.2000	0.1797
Cadmium	7440-43-9	mg/kg	46 : 49 : 49	0.23	54.0000	8.2488
Calcium	7440-70-2	mg/kg	49 : 49 : 49	520	21000.0000	6491.2245
Carbazole	86-74-8	mg/kg	1 : 49 : 49	0.62	0.6200	0.1281
Carbon disulfide	75-15-0	mg/kg	19 : 48 : 49	0.0033	0.0770	0.0110
Chlorobenzene	108-90-7	mg/kg	38 : 49 : 49	0.0035	9.7000	0.4497
Chloroform	67-66-3	mg/kg	1 : 5 : 49	0.0031	0.0031	0.0027
Chromium	7440-47-3	mg/kg	49 : 49 : 49	4.6	180.0000	51.2735

TABLE B-1
 SUMMARY STATISTICS CREEK BOTTOM SOILS
 SAUGET AREA 1 EE/CA AND RI/FS ADDENDUM - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Chemical	Cas rn	Units	Frequency of Detection	Minimum	Maximum Detect	Arithmetic Mean
Chrysene	218-01-9	mg/kg	5 : 49 : 49	0.032	1.9000	0.1673
Cobalt	7440-48-4	mg/kg	49 : 49 : 49	0.64	23.0000	8.5518
Copper	7440-50-8	mg/kg	49 : 49 : 49	6.2	10000.0000	484.1980
Cyanide	57-12-5	mg/kg	3 : 49 : 49	0.81	1.1000	0.3787
Dalapon	75-99-0	mg/kg	1 : 5 : 49	0.041	0.0410	0.0395
delta-BHC	319-86-8	mg/kg	2 : 44 : 49	0.00071	0.0041	0.0005
di-n-Butylphthalate	84-74-2	mg/kg	7 : 49 : 49	0.056	0.2100	0.1146
Dibenz(a,h)anthracene	53-70-3	mg/kg	3 : 49 : 49	0.18	0.3400	0.0720
Dibenzofuran	132-64-9	mg/kg	1 : 49 : 49	1.6	1.6000	0.1481
Dicamba	1918-00-9	mg/kg	12 : 12 : 49	0.0016	0.0053	0.0028
Dichlorprop	120-36-5	mg/kg	1 : 1 : 49	0.0066	0.0066	0.0066
Diehrin	60-57-1	mg/kg	8 : 47 : 49	0.00042	0.0490	0.0077
Endosulfan II	33213-65-9	mg/kg	1 : 42 : 49	0.01	0.0100	0.0026
Endosulfan sulfate	1031-07-8	mg/kg	1 : 44 : 49	0.012	0.0120	0.0029
Endrin ketone	53494-70-5	mg/kg	3 : 3 : 49	0.00064	0.0015	0.0010
Ethylbenzene	100-41-4	mg/kg	7 : 49 : 49	0.0047	3.2000	0.1137
Fluoranthene	206-44-0	mg/kg	9 : 49 : 49	0.051	4.0000	0.2348
Fluorene	86-73-7	mg/kg	2 : 49 : 49	0.1	3.5000	0.1859
gamma-BHC (Lindane)	58-89-9	mg/kg	10 : 40 : 49	0.00015	0.0023	0.0011
gamma-Chlordane	5103-74-2	mg/kg	2 : 2 : 49	0.00034	0.0004	0.0004
Heptachlor	76-44-8	mg/kg	3 : 32 : 49	0.00032	0.0012	0.0011
Heptachlor epoxide	1024-57-3	mg/kg	14 : 49 : 49	0.0002	0.4100	0.0143
Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	4 : 49 : 49	0.15	0.8300	0.1386
Iron	7439-89-6	mg/kg	49 : 49 : 49	440	28000.0000	13755.9184
Lead	7439-92-1	mg/kg	49 : 49 : 49	5.5	700.0000	74.6082
Magnesium	7439-95-4	mg/kg	49 : 49 : 49	94	6900.0000	3715.7959
Manganese	7439-96-5	mg/kg	49 : 49 : 49	4	530.0000	130.1429
MCPP	7085-19-0	mg/kg	3 : 47 : 49	2.4	6.1000	1.6096
Mercury	7439-97-6	mg/kg	48 : 49 : 49	0.013	0.8400	0.1344
Methoxychlor	72-43-5	mg/kg	6 : 6 : 49	0.00041	0.0066	0.0017
Methylene chloride	75-09-2	mg/kg	4 : 6 : 49	0.0018	0.0029	0.0024
Molybdenum	7439-98-7	mg/kg	27 : 49 : 49	0.28	2.8000	0.7794
N-Nitrosodiphenylamine	86-30-6	mg/kg	4 : 49 : 49	0.048	1.2000	0.1367
Naphthalene	91-20-3	mg/kg	5 : 49 : 49	0.071	6.0000	0.2607
Nickel	7440-02-0	mg/kg	49 : 49 : 49	1.9	630.0000	191.6204
Nitrobenzene	98-95-3	mg/kg	2 : 49 : 49	0.16	0.5200	0.1266
Pentachlorophenol	87-86-5	mg/kg	37 : 49 : 49	0.0019	44.0000	0.9874
Phenanthrene	85-01-8	mg/kg	6 : 49 : 49	0.052	7.0000	0.3009
Phenol	108-95-2	mg/kg	3 : 49 : 49	0.11	3.4000	0.1851
Potassium	7440-09-7	mg/kg	49 : 49 : 49	780	3200.0000	1758.5714
Pyrene	129-00-0	mg/kg	5 : 49 : 49	0.1065	4.0000	0.2424
Selenium	7782-49-2	mg/kg	2 : 49 : 49	0.7	4.5000	0.8092
Silver	7440-22-4	mg/kg	10 : 49 : 49	0.23	9.0000	0.7776
Sodium	7440-23-5	mg/kg	49 : 49 : 49	87	670.0000	199.1020
Styrene	100-42-5	mg/kg	1 : 3 : 49	0.0028	0.0028	0.0025
Tetrachloroethene	127-18-4	mg/kg	3 : 48 : 49	0.0083	0.0700	0.0053
Thallium	7440-28-0	mg/kg	3 : 49 : 49	0.76	1.3000	0.6289
Tin	7440-31-5	mg/kg	9 : 49 : 49	5.2	470.0000	14.3551
Toluene	108-88-3	mg/kg	16 : 49 : 49	0.002	0.2900	0.0146
Total PCBs	1336-36-3	mg/kg	38 : 49 : 49	0.0467	86.0600	2.7758
Trichloroethene	79-01-6	mg/kg	3 : 48 : 49	0.0068	0.0340	0.0045
Vanadium	7440-62-2	mg/kg	49 : 49 : 49	3.8	47.0000	25.3449
Xylenes (total)	1330-20-7	mg/kg	13 : 49 : 49	0.0031	29.0000	0.7639
Zinc	7440-66-6	mg/kg	49 : 49 : 49	20	10450.0000	2160.5918

TABLE B-1
 SUMMARY STATISTICS CREEK BOTTOM SOILS
 SAUGET AREA 1 EE/CA AND RI/FS ADDENDUM - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Chemical	Cas rn	Units	Frequency of Detection	Minimum	Maximum Detect	Arithmetic Mean
Creek Segment C						
2,3,7,8-TCDD-TEQ	1746-01-6	mg/kg	9 : 9 : 9	0.000002966	0.0000	0.0000
2-Butanone (MEK)	78-93-3	mg/kg	3 : 3 : 9	0.0057	0.0099	0.0076
Acetone	67-64-1	mg/kg	5 : 9 : 9	0.0096	0.0830	0.0342
alpha-Chlordane	5103-71-9	mg/kg	1 : 1 : 9	0.00092	0.0009	0.0009
Aluminum	7429-90-5	mg/kg	9 : 9 : 9	8100	13000.0000	10811.1111
Antimony	7440-36-0	mg/kg	1 : 1 : 9	0.79	0.7900	0.7900
Arsenic	7440-38-2	mg/kg	9 : 9 : 9	3	14.0000	9.7000
Barium	7440-39-3	mg/kg	9 : 9 : 9	200	330.0000	249.4444
Benzene	71-43-2	mg/kg	1 : 1 : 9	0.003	0.0030	0.0030
Benzo(g,h,i)perylene	191-24-2	mg/kg	1 : 1 : 9	0.065	0.0650	0.0650
Beryllium	7440-41-7	mg/kg	9 : 9 : 9	0.68	0.9600	0.8278
Cadmium	7440-43-9	mg/kg	9 : 9 : 9	1.6	24.0000	13.2833
Calcium	7440-70-2	mg/kg	9 : 9 : 9	3600	14000.0000	7805.5556
Chlorobenzene	108-90-7	mg/kg	9 : 9 : 9	0.0023	0.7000	0.1302
Chromium	7440-47-3	mg/kg	9 : 9 : 9	18	110.0000	36.1111
Cobalt	7440-48-4	mg/kg	9 : 9 : 9	5	14.0000	9.4111
Copper	7440-50-8	mg/kg	9 : 9 : 9	40	250.0000	109.1111
delta-BHC	319-86-8	mg/kg	3 : 6 : 9	0.00037	0.0010	0.0007
Dicamba	1918-00-9	mg/kg	1 : 1 : 9	0.0066	0.0066	0.0066
Dichlorprop	120-36-5	mg/kg	1 : 1 : 9	0.0062	0.0062	0.0062
Dieldrin	60-57-1	mg/kg	8 : 9 : 9	0.00046	0.0110	0.0048
Endosulfan sulfate	1031-07-8	mg/kg	3 : 7 : 9	0.00072	0.0070	0.0042
Endrin ketone	53494-70-5	mg/kg	1 : 6 : 9	0.01	0.0100	0.0057
gamma-Chlordane	5103-74-2	mg/kg	1 : 1 : 9	0.0011	0.0011	0.0011
Iron	7439-89-6	mg/kg	9 : 9 : 9	12000	21000.0000	17611.1111
Lead	7439-92-1	mg/kg	9 : 9 : 9	18	140.0000	43.2222
Magnesium	7439-95-4	mg/kg	9 : 9 : 9	2800	6700.0000	4427.7778
Manganese	7439-96-5	mg/kg	9 : 9 : 9	79	390.0000	188.7778
Mercury	7439-97-6	mg/kg	9 : 9 : 9	0.046	0.3100	0.0956
Methoxychlor	72-43-5	mg/kg	3 : 3 : 9	0.0025	0.0071	0.0042
Methylene chloride	75-09-2	mg/kg	4 : 9 : 9	0.0023	0.0048	0.0035
Nickel	7440-02-0	mg/kg	9 : 9 : 9	60	570.0000	263.0556
Pentachlorophenol	87-86-5	mg/kg	7 : 9 : 9	0.0016	0.0140	0.0061
Phenanthrene	85-01-8	mg/kg	1 : 1 : 9	0.025	0.0250	0.0250
Potassium	7440-09-7	mg/kg	9 : 9 : 9	1400	2300.0000	1872.2222
Sodium	7440-23-5	mg/kg	9 : 9 : 9	90	200.0000	123.8889
Styrene	100-42-5	mg/kg	1 : 1 : 9	0.0027	0.0027	0.0027
Tin	7440-31-5	mg/kg	1 : 9 : 9	7.5	7.5000	3.9306
Toluene	108-88-3	mg/kg	4 : 9 : 9	0.0033	0.0075	0.0041
Total PCBs	1336-36-3	mg/kg	6 : 9 : 9	0.0403	0.1782	0.0691
Vanadium	7440-62-2	mg/kg	9 : 9 : 9	23	37.0000	31.0000
Xylenes (total)	1330-20-7	mg/kg	1 : 9 : 9	0.0043	0.0043	0.0037
Zinc	7440-66-6	mg/kg	9 : 9 : 9	340	3400.0000	2136.6667

TABLE B-1
 SUMMARY STATISTICS CREEK BOTTOM SOILS
 SAUGET AREA 1 EE/CA AND RI/FS ADDENDUM - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Chemical	Cas rn	Units	Frequency of Detection	Minimum	Maximum Detect	Arithmetic Mean
Creek Segment D						
1,4-Dichlorobenzene	106-46-7	mg/kg	2 : 6 : 6	0.053	0.1300	0.1122
2,3,7,8-TCDD-TEQ	1746-01-6	mg/kg	6 : 6 : 6	0.000014271	0.0009	0.0002
2,4,5-T	93-76-5	mg/kg	1 : 1 : 6	0.0054	0.0054	0.0054
2-Butanone (MEK)	78-93-3	mg/kg	3 : 3 : 6	0.0063	0.0100	0.0081
4,4'-DDD	72-54-8	mg/kg	1 : 1 : 6	0.0014	0.0014	0.0014
4,4'-DDT	50-29-3	mg/kg	1 : 6 : 6	0.24	0.2400	0.0562
Aldrin	309-00-2	mg/kg	2 : 5 : 6	0.00075	0.0090	0.0050
alpha-Chlordane	5103-71-9	mg/kg	1 : 5 : 6	0.012	0.0120	0.0068
Aluminum	7429-90-5	mg/kg	6 : 6 : 6	8300	14000.0000	10900.0000
Arsenic	7440-38-2	mg/kg	6 : 6 : 6	5.7	18.0000	11.4000
Barium	7440-39-3	mg/kg	6 : 6 : 6	200	570.0000	311.6667
Benzo(a)pyrene	50-32-8	mg/kg	3 : 6 : 6	0.049	0.1400	0.0848
Benzo(b)fluoranthene	205-99-2	mg/kg	1 : 6 : 6	0.2	0.2000	0.1358
Benzo(g,h,i)perylene	191-24-2	mg/kg	2 : 6 : 6	0.13	0.2200	0.1400
Benzo(k)fluoranthene	207-08-9	mg/kg	1 : 6 : 6	0.21	0.2100	0.1375
Beryllium	7440-41-7	mg/kg	6 : 6 : 6	0.65	0.9900	0.8383
Cadmium	7440-43-9	mg/kg	6 : 6 : 6	8.5	40.0000	19.7500
Calcium	7440-70-2	mg/kg	6 : 6 : 6	4000	25000.0000	8533.3333
Chlorobenzene	108-90-7	mg/kg	5 : 6 : 6	0.002	0.1500	0.0313
Chromium	7440-47-3	mg/kg	6 : 6 : 6	41	57.0000	49.3333
Cobalt	7440-48-4	mg/kg	6 : 6 : 6	6	12.0000	9.4667
Copper	7440-50-8	mg/kg	6 : 6 : 6	79	1600.0000	385.5000
Dalapon	75-99-0	mg/kg	1 : 6 : 6	0.05	0.0500	0.0475
delta-BHC	319-86-8	mg/kg	4 : 5 : 6	0.00043	0.0019	0.0008
Dicamba	1918-00-9	mg/kg	1 : 1 : 6	0.0018	0.0018	0.0018
Dichlorprop	120-36-5	mg/kg	1 : 1 : 6	0.021	0.0210	0.0210
Dieldrin	60-57-1	mg/kg	5 : 6 : 6	0.0013	0.6900	0.1274
Endosulfan sulfate	1031-07-8	mg/kg	1 : 2 : 6	0.0095	0.0095	0.0071
Fluoranthene	206-44-0	mg/kg	4 : 6 : 6	0.069	0.1900	0.1307
gamma-Chlordane	5103-74-2	mg/kg	2 : 6 : 6	0.004	0.0670	0.0155
Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	2 : 6 : 6	0.11	0.1800	0.1300
Iron	7439-89-6	mg/kg	6 : 6 : 6	14000	20000.0000	17166.6667
Lead	7439-92-1	mg/kg	6 : 6 : 6	23	280.0000	98.1667
Magnesium	7439-95-4	mg/kg	6 : 6 : 6	2900	5000.0000	3766.6667
Manganese	7439-96-5	mg/kg	6 : 6 : 6	100	190.0000	136.6667
Mercury	7439-97-6	mg/kg	6 : 6 : 6	0.065	0.7100	0.2375
Methoxychlor	72-43-5	mg/kg	3 : 4 : 6	0.004	0.0620	0.0247
Methylene chloride	75-09-2	mg/kg	4 : 4 : 6	0.0023	0.0032	0.0027
Molybdenum	7439-98-7	mg/kg	2 : 6 : 6	4.7	7.0000	2.3300
Nickel	7440-02-0	mg/kg	6 : 6 : 6	90	530.0000	286.6667
Pentachlorophenol	87-86-5	mg/kg	5 : 6 : 6	0.0024	0.0130	0.0069
Phenanthrene	85-01-8	mg/kg	2 : 4 : 6	0.047	0.1200	0.1005
Potassium	7440-09-7	mg/kg	6 : 6 : 6	1600	2100.0000	1800.0000
Pyrene	129-00-0	mg/kg	3 : 6 : 6	0.12	0.1600	0.1317
Selenium	7782-49-2	mg/kg	1 : 5 : 6	2.8	2.8000	1.2700
Silver	7440-22-4	mg/kg	1 : 6 : 6	1.5	1.5000	0.8250
Sodium	7440-23-5	mg/kg	6 : 6 : 6	120	330.0000	175.0000
Tin	7440-31-5	mg/kg	2 : 6 : 6	6.6	11.0000	5.2333
Toluene	108-88-3	mg/kg	1 : 1 : 6	0.0029	0.0029	0.0029
Total PCBs	1336-36-3	mg/kg	5 : 6 : 6	0.0454	2.4396	0.4915
Vanadium	7440-62-2	mg/kg	6 : 6 : 6	26	36.0000	31.5000
Zinc	7440-66-6	mg/kg	6 : 6 : 6	1800	8200.0000	4100.0000

TABLE B-1
 SUMMARY STATISTICS CREEK BOTTOM SOILS
 SAUGET AREA 1 EE/CA AND RI/FS ADDENDUM - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Chemical	Cas rn	Units	Frequency of Detection	Minimum	Maximum Detect	Arithmetic Mean
Creek Segment E						
1,4-Dichlorobenzene	106-46-7	mg/kg	1 : 17 : 17	0.23	0.2300	0.1301
2,3,7,8-TCDD-TEQ	1746-01-6	mg/kg	14 : 17 : 17	0.000006624	0.0001	0.0000
2,4-D	94-75-7	mg/kg	2 : 17 : 17	0.016	0.0350	0.0083
2-Butanone (MEK)	78-93-3	mg/kg	5 : 5 : 17	0.0073	0.0140	0.0106
4,4'-DDD	72-54-8	mg/kg	2 : 17 : 17	0.00059	0.0470	0.0062
4,4'-DDE	72-55-9	mg/kg	6 : 15 : 17	0.00024	0.0072	0.0021
4,4'-DDT	50-29-3	mg/kg	7 : 17 : 17	0.00056	0.0170	0.0045
Acetone	67-64-1	mg/kg	9 : 17 : 17	0.018	0.0730	0.0378
alpha-BHC	319-84-6	mg/kg	1 : 15 : 17	0.0013	0.0013	0.0004
alpha-Chlordane	5103-71-9	mg/kg	1 : 17 : 17	0.0087	0.0087	0.0023
Aluminum	7429-90-5	mg/kg	17 : 17 : 17	5500	14000.0000	9967.6471
Anthracene	120-12-7	mg/kg	1 : 1 : 17	0.05	0.0500	0.0500
Antimony	7440-36-0	mg/kg	3 : 17 : 17	0.75	4.7000	1.4341
Arsenic	7440-38-2	mg/kg	16 : 17 : 17	2.8	20.0000	8.0824
Barium	7440-39-3	mg/kg	17 : 17 : 17	150	640.0000	252.0588
Benzo(a)anthracene	56-55-3	mg/kg	3 : 17 : 17	0.058	0.2600	0.1256
Benzo(a)pyrene	50-32-8	mg/kg	3 : 17 : 17	0.072	0.4200	0.0897
Benzo(b)fluoranthene	205-99-2	mg/kg	4 : 17 : 17	0.037	0.5100	0.1407
Benzo(g,h,i)perylene	191-24-2	mg/kg	3 : 17 : 17	0.069	0.3500	0.1351
Benzo(k)fluoranthene	207-08-9	mg/kg	3 : 17 : 17	0.083	0.3700	0.1353
Beryllium	7440-41-7	mg/kg	17 : 17 : 17	0.31	1.1000	0.7444
Bis(2-ethylhexyl)phthalate	117-81-7	mg/kg	1 : 1 : 17	0.077	0.0770	0.0770
Cadmium	7440-43-9	mg/kg	17 : 17 : 17	3.1	38.0000	14.2147
Calcium	7440-70-2	mg/kg	17 : 17 : 17	3300	13000.0000	8017.6471
Chlorobenzene	108-90-7	mg/kg	12 : 17 : 17	0.002	0.2100	0.0233
Chromium	7440-47-3	mg/kg	17 : 17 : 17	14	170.0000	47.2941
Chrysene	218-01-9	mg/kg	4 : 17 : 17	0.037	0.3700	0.1315
Cobalt	7440-48-4	mg/kg	17 : 17 : 17	3.2	13.0000	8.0794
Copper	7440-50-8	mg/kg	17 : 17 : 17	24.5	4300.0000	425.2059
Cyanide	57-12-5	mg/kg	1 : 17 : 17	2.6	2.6000	0.5031
di-n-Butylphthalate	84-74-2	mg/kg	1 : 1 : 17	0.074	0.0740	0.0740
Dibenzo(a,h)anthracene	53-70-3	mg/kg	1 : 17 : 17	0.14	0.1400	0.0693
Dicamba	1918-00-9	mg/kg	1 : 1 : 17	0.0025	0.0025	0.0025
Dieldrin	60-57-1	mg/kg	13 : 17 : 17	0.00019	0.0340	0.0055
Endosulfan I	959-98-8	mg/kg	3 : 3 : 17	0.00011	0.0002	0.0001
Endosulfan II	33213-65-9	mg/kg	1 : 1 : 17	0.00066	0.0007	0.0007
Endosulfan sulfate	1031-07-8	mg/kg	2 : 17 : 17	0.0015	0.0160	0.0036
Ethylbenzene	100-41-4	mg/kg	1 : 17 : 17	0.0049	0.0049	0.0036
Fluoranthene	206-44-0	mg/kg	4 : 17 : 17	0.059	0.7100	0.1630
gamma-Chlordane	5103-74-2	mg/kg	2 : 16 : 17	0.00024	0.0055	0.0017
Heptachlor epoxide	1024-57-3	mg/kg	5 : 5 : 17	0.00018	0.0006	0.0004
Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	2 : 17 : 17	0.16	0.3500	0.1378
Iron	7439-89-6	mg/kg	17 : 17 : 17	7500	27000.0000	17776.4706
Lead	7439-92-1	mg/kg	17 : 17 : 17	17	400.0000	78.5000
Magnesium	7439-95-4	mg/kg	17 : 17 : 17	1500	6900.0000	4505.8824
Manganese	7439-96-5	mg/kg	17 : 17 : 17	61	300.0000	173.0000
Mercury	7439-97-6	mg/kg	17 : 17 : 17	0.083	1.6000	0.4059
Methoxychlor	72-43-5	mg/kg	3 : 3 : 17	0.00049	0.0009	0.0007
Methylene chloride	75-09-2	mg/kg	3 : 6 : 17	0.0018	0.0033	0.0028
Molybdenum	7439-98-7	mg/kg	2 : 17 : 17	0.46	1.5000	0.3840
Nickel	7440-02-0	mg/kg	17 : 17 : 17	44	600.0000	181.2647
Pentachlorophenol	87-86-5	mg/kg	7 : 17 : 17	0.0016	0.0330	0.0113
Phenanthrene	85-01-8	mg/kg	4 : 17 : 17	0.051	0.2900	0.1256

TABLE B-1
 SUMMARY STATISTICS CREEK BOTTOM SOILS
 SAUGET AREA 1 EE/CA AND RI/FS ADDENDUM - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Chemical	Cas rn	Units	Frequency of Detection	Minimum	Maximum Detect	Arithmetic Mean
Potassium	7440-09-7	mg/kg	17 : 17 : 17	1300	2900.0000	2070.5882
Pyrene	129-00-0	mg/kg	3 : 17 : 17	0.1	0.4800	0.1475
Silver	7440-22-4	mg/kg	3 : 17 : 17	0.61	9.8000	1.2029
Sodium	7440-23-5	mg/kg	17 : 17 : 17	160	390.0000	241.1765
Thallium	7440-28-0	mg/kg	1 : 16 : 17	0.88	0.8800	0.6608
Tin	7440-31-5	mg/kg	3 : 17 : 17	6.7	31.0000	5.6044
Toluene	108-88-3	mg/kg	3 : 17 : 17	0.0026	0.0045	0.0037
Total PCBs	1336-36-3	mg/kg	10 : 17 : 17	0.04605	1.2517	0.1869
Vanadium	7440-62-2	mg/kg	17 : 17 : 17	18	39.0000	29.4706
Zinc	7440-66-6	mg/kg	17 : 17 : 17	320	5900.0000	1923.8235
Creek Segment F						
1,1,2,2-Tetrachloroethane	79-34-5	mg/kg	1 : 16 : 16	0.01	0.0100	0.0039
1,1,2-Trichloroethane	79-00-5	mg/kg	1 : 16 : 16	0.0061	0.0061	0.0037
1,2-Dichloroethane	107-06-2	mg/kg	1 : 1 : 16	0.0021	0.0021	0.0021
1,4-Dichlorobenzene	106-46-7	mg/kg	1 : 1 : 16	0.094	0.0940	0.0940
2,3,7,8-TCDD-TEQ	1746-01-6	mg/kg	16 : 16 : 16	0.000011321	0.0008	0.0001
2,4-D	94-75-7	mg/kg	3 : 16 : 16	0.0023	0.0263	0.0070
2-Butanone (MEK)	78-93-3	mg/kg	7 : 8 : 16	0.0075	0.0140	0.0103
4,4'-DDE	72-55-9	mg/kg	4 : 4 : 15	0.00036	0.0016	0.0010
4,4'-DDT	50-29-3	mg/kg	3 : 15 : 15	0.00029	0.0075	0.0034
Acetone	67-64-1	mg/kg	7 : 16 : 16	0.029	0.0640	0.0422
Aldrin	309-00-2	mg/kg	1 : 1 : 16	0.00023	0.0002	0.0002
alpha-Chlordane	5103-71-9	mg/kg	2 : 15 : 16	0.0028	0.0041	0.0020
Aluminum	7429-90-5	mg/kg	16 : 16 : 16	5100	12000.0000	8862.5000
Antimony	7440-36-0	mg/kg	2 : 3 : 16	0.62	0.6600	0.6267
Arsenic	7440-38-2	mg/kg	15 : 16 : 16	4.1	19.0000	9.7125
Barium	7440-39-3	mg/kg	16 : 16 : 16	160	330.0000	218.7500
Benzo(a)anthracene	56-55-3	mg/kg	4 : 4 : 16	0.035	0.0920	0.0623
Benzo(a)pyrene	50-32-8	mg/kg	5 : 16 : 16	0.049	0.1900	0.0695
Benzo(b)fluoranthene	205-99-2	mg/kg	5 : 16 : 16	0.039	0.1800	0.1143
Benzo(g,h,i)perylene	191-24-2	mg/kg	5 : 15 : 16	0.049	0.1300	0.1073
Benzo(k)fluoranthene	207-08-9	mg/kg	4 : 15 : 16	0.044	0.1300	0.1101
Beryllium	7440-41-7	mg/kg	13 : 16 : 16	0.38	0.8900	0.6098
beta-BHC	319-85-7	mg/kg	1 : 16 : 16	0.0039	0.0039	0.0008
Bis(2-ethylhexyl)phthalate	117-81-7	mg/kg	4 : 6 : 16	0.068	0.1100	0.0906
Bromodichloromethane	75-27-4	mg/kg	1 : 1 : 16	0.0013	0.0013	0.0013
Bromoform	75-25-2	mg/kg	1 : 2 : 16	0.003	0.0030	0.0030
Cadmium	7440-43-9	mg/kg	15 : 16 : 16	0.77	57.0000	20.3078
Calcium	7440-70-2	mg/kg	16 : 16 : 16	5450	17000.0000	9803.1250
Chlorobenzene	108-90-7	mg/kg	3 : 16 : 16	0.0052	0.0140	0.0044
Chromium	7440-47-3	mg/kg	16 : 16 : 16	9.3	29.0000	16.8094
Chrysene	218-01-9	mg/kg	5 : 16 : 16	0.0385	0.1400	0.1084
Cobalt	7440-48-4	mg/kg	16 : 16 : 16	5.6	13.0000	8.8375
Copper	7440-50-8	mg/kg	16 : 16 : 16	20	505.0000	119.6875
Cyanide	57-12-5	mg/kg	2 : 16 : 16	1.2	4.5700	0.6559
Dibromochloromethane	124-48-1	mg/kg	1 : 1 : 16	0.002	0.0020	0.0020
Dicamba	1918-00-9	mg/kg	4 : 4 : 16	0.0021	0.0063	0.0041
Dieldrin	60-57-1	mg/kg	9 : 16 : 16	0.00035	0.0082	0.0023
Endosulfan sulfate	1031-07-8	mg/kg	1 : 10 : 16	0.0043	0.0043	0.0027
Fluoranthene	206-44-0	mg/kg	5 : 16 : 16	0.0525	0.1700	0.1118
gamma-Chlordane	5103-74-2	mg/kg	6 : 16 : 16	0.00046	0.0038	0.0015
Hexachlorobutadiene	87-68-3	mg/kg	1 : 1 : 16	0.061	0.0610	0.0610
Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	2 : 5 : 16	0.092	0.1100	0.1064

TABLE B-1
 SUMMARY STATISTICS CREEK BOTTOM SOILS
 SAUGET AREA 1 EE/CA AND RI/FS ADDENDUM - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Chemical	Cas rn	Units	Frequency of Detection	Minimum	Maximum Detect	Arithmetic Mean
Iron	7439-89-6	mg/kg	16 : 16 : 16	11000	41000.0000	19340.6250
Lead	7439-92-1	mg/kg	16 : 16 : 16	7.5	450.0000	58.1250
Magnesium	7439-95-4	mg/kg	16 : 16 : 16	3700	8200.0000	5271.8750
Manganese	7439-96-5	mg/kg	16 : 16 : 16	170	890.0000	334.8438
MCPP	7085-19-0	mg/kg	1 : 16 : 16	2.3	2.3000	1.4625
Mercury	7439-97-6	mg/kg	16 : 16 : 16	0.018	0.8200	0.1911
Methylene chloride	75-09-2	mg/kg	4 : 15 : 16	0.0018	0.0043	0.0033
Molybdenum	7439-98-7	mg/kg	2 : 16 : 16	0.37	2.2000	0.5903
Nickel	7440-02-0	mg/kg	16 : 16 : 16	15	630.0000	167.3750
Pentachlorophenol	87-86-5	mg/kg	8 : 16 : 16	0.0015	0.0240	0.0091
Phenanthrene	85-01-8	mg/kg	4 : 4 : 16	0.03	0.0980	0.0593
Potassium	7440-09-7	mg/kg	16 : 16 : 16	940	2300.0000	1592.8125
Pyrene	129-00-0	mg/kg	2 : 16 : 16	0.11	0.1600	0.1213
Selenium	7782-49-2	mg/kg	1 : 15 : 16	1.8	1.8000	0.6892
Silver	7440-22-4	mg/kg	1 : 16 : 16	0.79	0.7900	0.6650
Sodium	7440-23-5	mg/kg	15 : 16 : 16	96	290.0000	137.8438
Tin	7440-31-5	mg/kg	1 : 16 : 16	17	17.0000	3.7734
Toluene	108-88-3	mg/kg	8 : 16 : 16	0.0023	0.0077	0.0043
Total PCBs	1336-36-3	mg/kg	7 : 16 : 16	0.0369	0.3569	0.0675
Vanadium	7440-62-2	mg/kg	16 : 16 : 16	17	34.0000	25.6563
Xylenes (total)	1330-20-7	mg/kg	1 : 15 : 16	0.00405	0.0041	0.0034
Zinc	7440-66-6	mg/kg	16 : 16 : 16	59	15000.0000	2238.3750
Site M						
1,2,4-Trichlorobenzene	120-82-1	mg/kg	2 : 5 : 9	0.029	0.1600	0.1038
1,2-Dichlorobenzene	95-50-1	mg/kg	1 : 5 : 9	0.21	0.2100	0.1290
1,4-Dichlorobenzene	106-46-7	mg/kg	3 : 9 : 9	0.37	4.1000	0.9783
2,3,7,8-TCDD-TEQ	1746-01-6	mg/kg	9 : 9 : 9	0.00008382	0.0052	0.0010
2,4,5-T	93-76-5	mg/kg	1 : 1 : 9	0.0018	0.0018	0.0018
2,4-DB	94-82-6	mg/kg	2 : 9 : 9	0.039	0.0520	0.0172
2-Butanone (MEK)	78-93-3	mg/kg	9 : 9 : 9	0.0093	0.1000	0.0501
4,4'-DDE	72-55-9	mg/kg	1 : 7 : 9	0.035	0.0350	0.0167
4,4'-DDT	50-29-3	mg/kg	5 : 9 : 9	0.039	1.3000	0.2171
4-Chloroaniline	106-47-8	mg/kg	1 : 1 : 9	0.1	0.1000	0.1000
Acenaphthene	83-32-9	mg/kg	2 : 2 : 9	0.039	0.0860	0.0625
Acetone	67-64-1	mg/kg	8 : 9 : 9	0.017	0.5650	0.2074
alpha-BHC	319-84-6	mg/kg	1 : 5 : 9	0.0023	0.0023	0.0015
Aluminum	7429-90-5	mg/kg	9 : 9 : 9	2100	7500.0000	3872.2222
Anthracene	120-12-7	mg/kg	2 : 6 : 9	0.081	0.2300	0.1243
Antimony	7440-36-0	mg/kg	5 : 9 : 9	0.59	6.8000	2.9100
Arsenic	7440-38-2	mg/kg	9 : 9 : 9	2.9	25.0000	7.2778
Barium	7440-39-3	mg/kg	9 : 9 : 9	68	1800.0000	450.8889
Benzene	71-43-2	mg/kg	4 : 9 : 9	0.0047	0.0370	0.0084
Benzo(a)anthracene	56-55-3	mg/kg	8 : 9 : 9	0.026	0.7200	0.2542
Benzo(a)pyrene	50-32-8	mg/kg	5 : 8 : 9	0.055	0.4800	0.2141
Benzo(b)fluoranthene	205-99-2	mg/kg	5 : 7 : 9	0.084	0.6100	0.2371
Benzo(g,h,i)perylene	191-24-2	mg/kg	5 : 6 : 9	0.034	0.4100	0.1685
Benzo(k)fluoranthene	207-08-9	mg/kg	4 : 6 : 9	0.05	0.3400	0.1292
Beryllium	7440-41-7	mg/kg	9 : 9 : 9	0.16	0.5500	0.2939
Bis(2-ethylhexyl)phthalate	117-81-7	mg/kg	4 : 9 : 9	0.086	1.1300	0.4779
Cadmium	7440-43-9	mg/kg	9 : 9 : 9	0.68	17.0000	4.9200
Calcium	7440-70-2	mg/kg	9 : 9 : 9	3400	16000.0000	7544.4444
Carbazole	86-74-8	mg/kg	1 : 1 : 9	0.032	0.0320	0.0320
Carbon disulfide	75-15-0	mg/kg	8 : 9 : 9	0.0042	0.0795	0.0234

TABLE B-1
 SUMMARY STATISTICS CREEK BOTTOM SOILS
 SAUGET AREA 1 EE/CA AND RI/FS ADDENDUM - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Chemical	Cas rn	Units	Frequency of Detection	Minimum	Maximum Detect	Arithmetic Mean
Chlorobenzene	108-90-7	mg/kg	8 : 9 : 9	0.0032	1.2000	0.3384
Chromium	7440-47-3	mg/kg	9 : 9 : 9	7.2	55.0000	18.5111
Chrysene	218-01-9	mg/kg	8 : 9 : 9	0.037	0.8150	0.2988
Cobalt	7440-48-4	mg/kg	9 : 9 : 9	3.2	23.5000	8.2444
Copper	7440-50-8	mg/kg	9 : 9 : 9	110	4900.0000	1437.7778
Cyanide	57-12-5	mg/kg	2 : 9 : 9	0.775	0.9900	0.6961
Dibenzo(a,h)anthracene	53-70-3	mg/kg	2 : 5 : 9	0.078	0.1500	0.0806
Dibenzofuran	132-64-9	mg/kg	1 : 1 : 9	0.077	0.0770	0.0770
Dicamba	1918-00-9	mg/kg	2 : 2 : 9	0.0026	0.0033	0.0030
Dichlorprop	120-36-5	mg/kg	1 : 1 : 9	0.024	0.0240	0.0240
Endrin aldehyde	7421-93-4	mg/kg	6 : 9 : 9	0.0093	0.8300	0.1156
Ethylbenzene	100-41-4	mg/kg	4 : 9 : 9	0.0044	0.0110	0.0049
Fluoranthene	206-44-0	mg/kg	8 : 9 : 9	0.056	1.7000	0.5076
Fluorene	86-73-7	mg/kg	3 : 6 : 9	0.04	0.4900	0.1733
gamma-BHC (Lindane)	58-89-9	mg/kg	4 : 4 : 9	0.00099	0.0044	0.0028
Heptachlor	76-44-8	mg/kg	2 : 9 : 9	0.01	0.1600	0.0266
Heptachlor epoxide	1024-57-3	mg/kg	3 : 9 : 9	0.012	0.8600	0.1080
Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	2 : 5 : 9	0.087	0.1700	0.1174
Iron	7439-89-6	mg/kg	9 : 9 : 9	6300	18000.0000	10477.7778
Lead	7439-92-1	mg/kg	9 : 9 : 9	19	270.0000	92.3333
Magnesium	7439-95-4	mg/kg	9 : 9 : 9	1800	6500.0000	3277.7778
Manganese	7439-96-5	mg/kg	9 : 9 : 9	63	360.0000	121.8889
MCPP	7085-19-0	mg/kg	1 : 9 : 9	7.8	7.8000	2.0389
Mercury	7439-97-6	mg/kg	9 : 9 : 9	0.026	0.3000	0.1258
Molybdenum	7439-98-7	mg/kg	3 : 9 : 9	0.23	3.1500	0.6956
N-Nitrosodiphenylamine	86-30-6	mg/kg	1 : 6 : 9	0.6	0.6000	0.1908
Naphthalene	91-20-3	mg/kg	2 : 5 : 9	0.044	0.1600	0.1068
Nickel	7440-02-0	mg/kg	9 : 9 : 9	110	1500.0000	480.0000
Pentachlorophenol	87-86-5	mg/kg	9 : 9 : 9	0.0099	0.2900	0.0637
Phenanthrene	85-01-8	mg/kg	7 : 9 : 9	0.023	1.4000	0.4162
Potassium	7440-09-7	mg/kg	9 : 9 : 9	430	1500.0000	812.7778
Pyrene	129-00-0	mg/kg	3 : 9 : 9	0.44	1.7000	0.6361
Silver	7440-22-4	mg/kg	7 : 9 : 9	0.37	5.6000	1.6656
Sodium	7440-23-5	mg/kg	8 : 9 : 9	86	260.0000	121.5556
Tin	7440-31-5	mg/kg	4 : 9 : 9	5.8	20.0000	7.3278
Toluene	108-88-3	mg/kg	8 : 9 : 9	0.0025	0.0420	0.0101
Total PCBs	1336-36-3	mg/kg	9 : 9 : 9	0.555	27.1380	5.3980
Vanadium	7440-62-2	mg/kg	9 : 9 : 9	8.7	23.0000	13.2000
Xylenes (total)	1330-20-7	mg/kg	5 : 9 : 9	0.011	0.1600	0.0440
Zinc	7440-66-6	mg/kg	9 : 9 : 9	310	12000.0000	3088.8889

TABLE B-2
 CALCULATION OF TOTAL PCBs
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Creek segment	B	B	B	B	B	B	B	B
Sample	CBS-CSB-T0-C1	CBS-CSB-T1-C1	CBS-CSB-T1-E1	CBS-CSB-T1-W1	CBS-CSB-T10-C1	CBS-CSB-T10-E1	CBS-CSB-T10-W1	CBS-CSB-T11-C1
Sample date	11/1/2001	10/31/2001	10/31/2001	10/31/2001	11/8/2001	11/8/2001	11/8/2001	11/19/2001
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte:								
Decachlorobiphenyl	1.3	0.025 U	0.015 J	0.023 J	0.024 U	0.0041 J	0.022 U	0.041 J
Dichlorobiphenyl	0.3	0.0035 J	0.0032 J	0.0088	0.0047 U	0.0044 UJ	0.0044 U	0.0038 J
Heptachlorobiphenyl	4	0.015 U	0.16	0.13	0.014 U	0.014 UJ	0.014 U	0.02 J
Hexachlorobiphenyl	4.8	0.0071 J	0.26	0.18	0.0024 J	0.0085 J	0.0063 J	0.041 J
Monochlorobiphenyl	0.024 U	0.005 U	0.0048 U	0.0046 U	0.0047 U	0.0044 UJ	0.0044 U	0.0046 UJ
Nonachlorobiphenyl	0.074 U	0.025 U	0.024 U	0.024 U	0.024 U	0.022 UJ	0.022 U	0.015 J
Octachlorobiphenyl	1.1	0.015 U	0.042	0.036	0.014 U	0.014 UJ	0.014 U	0.0068 J
Pentachlorobiphenyl	12	0.024	0.6	0.34	0.014	0.041 J	0.025	0.19 J
Tetrachlorobiphenyl	5.5	0.0088 J	0.5 J	0.42	0.0096 U	0.018 J	0.026	0.17 J
Trichlorobiphenyl	0.73	0.0018 J	0.073 J	0.082	0.0047 U	0.0014 J	0.0035 J	0.032 J
Total PCBs (a)	29.73	0.0852	1.6652	1.2318	0.0639	0.1024	0.1012	0.78605

Notes:

J - Detected, estimated.

U - Nondetected.

UJ - Nondetected,
 detection limit is estimated.

R - Rejected.

(a) - Calculated in
 accordance with the steps
 outlined in Section 3.1.3
 and 4.4 of the human
 health risk assessment.
 Note that totals are not
 presented for duplicates;
 the total for the parent
 sample is the average total
 of the sample and the
 duplicate.

TABLE B-2
 CALCULATION OF TOTAL PCBs
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Creek segment	B CBS-CSB-T11-C1-D	B CBS-CSB-T11-E1	B CBS-CSB-T11-W1	B CBS-CSB-T12-C1	B CBS-CSB-T12-E1	B CBS-CSB-T12-W1	B CBS-CSB-T13-C1	B CBS-CSB-T13-E1
Sample	11/19/2001	11/19/2001	11/19/2001	11/19/2001	11/19/2001	11/19/2001	11/19/2001	11/19/2001
Sample date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Units								
Analyte:								
Decachlorobiphenyl	0.055 J	0.008 J	0.0088 J	0.025 UJ	0.01 J	0.0056 J	0.023 UJ	0.02 UJ
Dichlorobiphenyl	0.0055 J	0.004 UJ	0.0042 UJ	0.0075 J	0.0039 UJ	0.0043 UJ	0.0046 UJ	0.0039 UJ
Heptachlorobiphenyl	0.046 J	0.012 UJ	0.015 J	0.015 UJ	0.012 UJ	0.013 UJ	0.014 UJ	0.012 UJ
Hexachlorobiphenyl	0.051 J	0.0097 J	0.012 J	0.01 UJ	0.015 J	0.015 J	0.0093 UJ	0.0046 J
Monochlorobiphenyl	0.0045 UJ	0.004 UJ	0.0042 UJ	0.0049 UJ	0.0039 UJ	0.0043 UJ	0.0046 UJ	0.0039 UJ
Nonachlorobiphenyl	0.02 J	0.0051 J	0.021 UJ	0.025 UJ	0.0063 J	0.022 UJ	0.023 UJ	0.02 UJ
Octachlorobiphenyl	0.015 J	0.012 UJ	0.0034 J	0.015 UJ	0.0011 J	0.013 UJ	0.014 UJ	0.012 UJ
Pentachlorobiphenyl	0.23 J	0.034 J	0.11 J	0.0014 J	0.044 J	0.035 J	0.0093 UJ	0.014 J
Tetrachlorobiphenyl	0.49 J	0.02 J	0.13 J	0.01 UJ	0.046 J	0.087 J	0.0093 UJ	0.0093 J
Trichlorobiphenyl	0.14 J	0.0043 J	0.02 J	0.023 J	0.007 J	0.017 J	0.0046 UJ	0.0016 J
Total PCBs (a)	0.0971	0.3139	0.0819	0.1393	0.1879	0.05555 U	0.0654	

Notes:

J - Detected, estimated.

U - Nondetected.

UJ - Nondetected,
 detection limit is estimated.

R - Rejected.

(a) - Calculated in
 accordance with the steps
 outlined in Section 3.1.3
 and 4.4 of the human
 health risk assessment.
 Note that totals are not
 presented for duplicates;
 the total for the parent
 sample is the average total
 of the sample and the
 duplicate.

TABLE B-2
 CALCULATION OF TOTAL PCBs
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Creek segment	B	B	B	B	B	B	B	B
Sample	CBS-CSB-T13-W1	CBS-CSB-T14-1	CBS-CSB-T15-1	CBS-CSB-T16-1	CBS-CSB-T17-C1	CBS-CSB-T17-E1	CBS-CSB-T17-E1D	CBS-CSB-T17-W1
Sample date	11/19/2001	12/20/2001	12/20/2001	12/20/2001	11/9/2001	11/9/2001	11/9/2001	11/9/2001
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte:								
Decachlorobiphenyl	0.022 UJ	0.026 U	0.0083 J	0.0074 J	0.027 U	0.016 J	0.051 J	0.024 U
Dichlorobiphenyl	0.0044 UJ	0.0051 U	0.0043 U	0.0048 U	0.0053 U	0.0048 UJ	0.014 J	0.0046 U
Heptachlorobiphenyl	0.014 UJ	0.015 U	0.0026 J	0.0038 J	0.016 U	0.019 J	0.081 J	0.014 U
Hexachlorobiphenyl	0.004 J	0.01 U	0.0044 J	0.012	0.011 U	0.045 J	0.11 J	0.0094 U
Monochlorobiphenyl	0.0044 UJ	0.0051 U	0.0043 U	0.0048 U	0.0053 U	0.0048 UJ	0.0022 J	0.0046 U
Nonachlorobiphenyl	0.022 UJ	0.026 U	0.0028 J	0.024 U	0.027 U	0.024 UJ	0.023 U	0.024 U
Octachlorobiphenyl	0.014 UJ	0.015 U	0.013 U	0.014 U	0.016 U	0.0051 J	0.023 J	0.014 U
Pentachlorobiphenyl	0.013 J	0.01 U	0.042	0.078	0.011 U	0.17 J	0.68 J	0.0094 U
Tetrachlorobiphenyl	0.019 J	0.01 U	0.036	0.016	0.011 U	0.085 J	0.21 J	0.0094 U
Trichlorobiphenyl	0.0028 J	0.0051 U	0.0043 U	0.0028 J	0.0053 U	0.018 J	0.049 J	0.0046 U
Total PCBs (a)	0.0792	0.0611 U	0.10905	0.1414	0.0648 U	0.8032		0.0567 U

Notes:

J - Detected, estimated.

U - Nondetected.

UJ - Nondetected,
detection limit is estimated.

R - Rejected.

(a) - Calculated in accordance with the steps outlined in Section 3.1.3 and 4.4 of the human health risk assessment. Note that totals are not presented for duplicates; the total for the parent sample is the average total of the sample and the duplicate.

TABLE B-2
 CALCULATION OF TOTAL PCBs
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Creek segment Sample	B CBS-CSB-T18-C1	B CBS-CSB-T18-E1	B CBS-CSB-T18-W1	B CBS-CSB-T18-W1D	B CBS-CSB-T2-C1	B CBS-CSB-T2-E1	B CBS-CSB-T2-W1	B CBS-CSB-T3-C1
Sample date	11/9/2001	11/9/2001	11/9/2001	11/9/2001	10/31/2001	10/31/2001	10/31/2001	10/31/2001
Units Analyte:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Decachlorobiphenyl	0.022 UJ	0.023 U	0.023 U	0.022 UJ	0.026 UJ	0.017 J	0.023 UJ	1.4 U
Dichlorobiphenyl	0.0044 UJ	0.0046 U	0.0045 U	0.0044 UJ	0.0052 UJ	0.0046 UJ	0.0044 UJ	0.27
Heptachlorobiphenyl	0.014 UJ	0.014 UJ	0.014 U	0.014 UJ	0.016 UJ	0.019 J	0.013 UJ	0.86 U
Hexachlorobiphenyl	0.009 UJ	0.0093 UJ	0.0092 U	0.009 UJ	0.011 UJ	0.04 J	0.0089 UJ	0.14
Monochlorobiphenyl	0.0044 UJ	0.0046 U	0.0045 U	0.0044 UJ	0.0052 UJ	0.0046 UJ	0.0044 UJ	0.28 U
Nonachlorobiphenyl	0.022 UJ	0.023 U	0.023 U	0.022 UJ	0.026 UJ	0.024 UJ	0.023 UJ	1.4 U
Octachlorobiphenyl	0.014 UJ	0.014 UJ	0.014 U	0.014 UJ	0.016 UJ	0.0047 J	0.013 UJ	0.86 U
Pentachlorobiphenyl	0.009 UJ	0.0093 U	0.0092 U	0.009 UJ	0.011 UJ	0.15 J	0.0089 UJ	0.77
Tetrachlorobiphenyl	0.009 UJ	0.0093 U	0.0092 U	0.009 UJ	0.011 UJ	0.018 J	0.0089 UJ	3.2
Trichlorobiphenyl	0.0044 UJ	0.0046 U	0.0045 U	0.0044 UJ	0.0021 J	0.0046 UJ	0.0044 UJ	2
Total PCBs (a)	0.0561 U	0.05555 U	0.0568 U		0.0632	0.2653	0.05595 U	7.94

Notes:

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detection limit is estimated.

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(a) - Calculated in accordance with the steps outlined in Section 3.1.3 and 4.4 of the human health risk assessment. Note that totals are not presented for duplicates; the total for the parent sample is the average total of the sample and the duplicate.

TABLE B-2
 CALCULATION OF TOTAL PCBs
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Creek segment Sample	B CBS-CSB-T3-E1	B CBS-CSB-T3-W1	B CBS-CSB-T4-C1	B CBS-CSB-T4-E1	B CBS-CSB-T4-W1	B CBS-CSB-T5-C1	B CBS-CSB-T5-E1	B CBS-CSB-T5-W1
Sample date	10/31/2001	10/31/2001	11/1/2001	11/1/2001	11/1/2001	11/1/2001	11/1/2001	11/1/2001
Units Analyte:	mg/kg							
Decachlorobiphenyl	1 U	0.023 UJ	R	0.01 J	0.025 UJ	0.0053 J	0.025 J	0.023 U
Dichlorobiphenyl	0.2 U	0.025 J	0.0022 J	0.0046 UJ	0.0049 UJ	0.0048 U	0.029 J	0.0045 U
Heptachlorobiphenyl	0.63 U	0.014 UJ	R	0.016 J	0.015 UJ	0.015 U	0.04 J	0.014 U
Hexachlorobiphenyl	0.83	0.0034 J	R	0.054 J	0.01 UJ	0.011	0.15 J	0.0092 U
Monochlorobiphenyl	0.2 U	0.0045 UJ	R	0.0046 UJ	0.0049 UJ	0.0048 U	0.0087 UJ	0.0045 U
Nonachlorobiphenyl	1 U	0.023 UJ	R	0.023 UJ	0.025 UJ	0.024 U	0.044 UJ	0.023 U
Octachlorobiphenyl	0.63 U	0.014 UJ	R	0.031 J	0.015 UJ	0.015 U	0.013 J	0.014 U
Pentachlorobiphenyl	18	0.031 J	0.015 J	0.15 J	0.0013 J	0.042	0.84 J	0.0092 U
Tetrachlorobiphenyl	51	0.053 J	0.025 J	0.056 J	0.0016 J	0.027	1 J	0.0092 U
Trichlorobiphenyl	15	0.12 J	0.0045 J	0.002 J	0.0032 J	0.024	0.48 J	0.0045 U
Total PCBs (a)	86.66	0.2694	0.0467	0.3328	0.05355	0.1387	2.577	0.0553 U

Notes:

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(a) - Calculated in
accordance with the steps
outlined in Section 3.1.3
and 4.4 of the human
health risk assessment.
Note that totals are not
presented for duplicates;
the total for the parent
sample is the average total
of the sample and the
duplicate.

TABLE B-2
 CALCULATION OF TOTAL PCBs
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Creek segment Sample Sample date Units Analyte:	B CBS-CSB-T6-C1 11/8/2001 mg/kg	B CBS-CSB-T6-C1-D 11/8/2001 mg/kg	B CBS-CSB-T6-E1 11/8/2001 mg/kg	B CBS-CSB-T6-W1 11/8/2001 mg/kg	B CBS-CSB-T7-C1 11/8/2001 mg/kg	B CBS-CSB-T7-E1 11/8/2001 mg/kg	B CBS-CSB-T7-W1 11/8/2001 mg/kg	B CBS-CSB-T8-C1 11/8/2001 mg/kg
Decachlorobiphenyl	0.0043 J	0.023 UJ	0.018 J	0.022 UJ	0.022 UJ	0.022 UJ	0.021 UJ	0.009 J
Dichlorobiphenyl	0.0046 U	0.0046 UJ	0.0028 J	0.0043 UJ	0.0044 UJ	0.0044 UJ	0.0042 UJ	0.0036 J
Heptachlorobiphenyl	0.014 U	0.014 UJ	0.014 J	0.013 UJ	0.014 UJ	0.013 UJ	0.0029 J	0.0048 J
Hexachlorobiphenyl	0.0093 U	0.0014 J	0.038 J	0.0088 UJ	0.0021 J	0.0015 J	0.0092 J	0.019 J
Monochlorobiphenyl	0.0046 U	0.0046 UJ	0.0038 UJ	0.0043 UJ	0.0044 UJ	0.0044 UJ	0.0042 UJ	0.0046 UJ
Nonachlorobiphenyl	0.023 U	0.023 UJ	0.019 UJ	0.022 UJ	0.022 UJ	0.022 UJ	0.021 UJ	0.023 UJ
Octachlorobiphenyl	0.014 U	0.014 UJ	0.0045 J	0.013 UJ	0.014 UJ	0.013 UJ	0.013 UJ	0.014 UJ
Pentachlorobiphenyl	0.0064 J	0.0071 J	0.24 J	0.0088 UJ	0.02 J	0.0051 J	0.074 J	0.11 J
Tetrachlorobiphenyl	0.013	0.0096 J	0.37 J	0.0088 UJ	0.028 J	0.0089 UJ	0.061 J	0.15 J
Trichlorobiphenyl	0.0053	0.0028 J	0.074 J	0.0018 J	0.0054 J	0.0044 UJ	0.0081 J	0.022 J
Total PCBs (a)	0.060825		0.7727	0.0543	0.0959	0.05265	0.1869	0.3369

Notes:

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(a) - Calculated in accordance with the steps outlined in Section 3.1.3 and 4.4 of the human health risk assessment. Note that totals are not presented for duplicates; the total for the parent sample is the average total of the sample and the duplicate.

TABLE B-2
 CALCULATION OF TOTAL PCBs
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Creek segment Sample	B CBS-CSB-T8-E1	B CBS-CSB-T8-W1	B CBS-CSB-T9-C1	B CBS-CSB-T9-E1	B CBS-CSB-T9-W1	C CBS-CSC-T1-1	C CBS-CSC-T2-1	C CBS-CSC-T3-1
Sample date	11/8/2001	11/8/2001	11/8/2001	11/8/2001	11/8/2001	12/13/2001	12/13/2001	12/13/2001
Units Analyte:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Decachlorobiphenyl	0.024 UJ	0.022 UJ	0.022 UJ	0.0028 J	0.0027 J	0.023 U	0.029	0.026 U
Dichlorobiphenyl	0.0047 UJ	0.0044 UJ	0.0044 UJ	0.0043 UJ	0.0043 U	0.0045 U	0.0079	0.0051 U
Heptachlorobiphenyl	0.014 UJ	0.014 UJ	0.014 UJ	0.013 UJ	0.0022 J	0.014 U	0.018	0.015 U
Hexachlorobiphenyl	0.0096 UJ	0.0023 J	0.009 UJ	0.0021 J	0.0084 J	0.0092 U	0.038	0.01 U
Monochlorobiphenyl	0.0047 UJ	0.0044 UJ	0.0044 UJ	0.0043 UJ	0.0043 U	0.0045 U	0.0014 J	0.0051 U
Nonachlorobiphenyl	0.024 UJ	0.022 UJ	0.022 UJ	0.022 UJ	0.022 U	0.023 U	0.011 J	0.026 U
Octachlorobiphenyl	0.014 UJ	0.014 UJ	0.014 UJ	0.013 UJ	0.013 U	0.014 U	0.011 J	0.015 U
Pentachlorobiphenyl	0.0096 UJ	0.017 J	0.009 UJ	0.0088 J	0.043	0.0011 J	0.027	0.0029 J
Tetrachlorobiphenyl	0.0096 UJ	0.029 J	0.009 UJ	0.0088 UJ	0.064	0.0092 U	0.03	0.01 U
Trichlorobiphenyl	0.0047 UJ	0.0045 J	0.0044 UJ	0.0043 UJ	0.0069	0.0045 U	0.0049	0.0051 U
Total PCBs (a)	0.0571 U	0.0932	0.0561 U	0.04855	0.149	0.0403	0.1782	0.046

Notes:

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accordance with the steps
outlined in Section 3.1.3
and 4.4 of the human
health risk assessment.
Note that totals are not
presented for duplicates;
the total for the parent
sample is the average total
of the sample and the
duplicate.

TABLE B-2
 CALCULATION OF TOTAL PCBs
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Creek segment Sample	C CBS-CSC-T4-1	C CBS-CSC-T4-1-FD	C CBS-CSC-T5-1	C CBS-CSC-T6-1	C CBS-CSC-T7-1	C CBS-CSC-T8-1	C CBS-CSC-T9-1	D CBS-CSD-T1-1
Sample date	12/13/2001	12/13/2001	12/13/2001	12/13/2001	12/13/2001	12/13/2001	12/13/2001	12/12/2001
Units Analyte:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Decachlorobiphenyl	0.025 U	0.0089 J	0.026 U	0.021 J	0.024 U	0.025 U	0.022 U	0.025 U
Dichlorobiphenyl	0.0049 U	0.005 U	0.0052 U	0.0052 U	0.0048 U	0.0049 U	0.0044 U	0.0049 U
Heptachlorobiphenyl	0.015 U	0.015 U	0.016 U	0.0036 J	0.015 U	0.015 U	0.014 U	0.015 U
Hexachlorobiphenyl	0.0034 J	0.015	0.01 U	0.01 J	0.0098 U	0.0073 J	0.009 U	0.01 U
Monochlorobiphenyl	0.0049 U	0.005 U	0.0052 U	0.0052 U	0.0048 U	0.0049 U	0.0044 U	0.0049 U
Nonachlorobiphenyl	0.025 U	0.025 U	0.026 U	0.0052 J	0.024 U	0.025 U	0.022 U	0.025 U
Octachlorobiphenyl	0.015 U	0.015 U	0.016 U	0.016 U	0.015 U	0.015 U	0.014 U	0.015 U
Pentachlorobiphenyl	0.0059 J	0.032	0.01 U	0.024	0.0098 U	0.017	0.009 U	0.01 U
Tetrachlorobiphenyl	0.01 U	0.0068 J	0.01 U	0.0068 J	0.0098 U	0.0023 J	0.009 U	0.01 U
Trichlorobiphenyl	0.0049 U	0.005 U	0.0052 U	0.0052 U	0.0048 U	0.0049 U	0.0044 U	0.0049 U
Total PCBs (a)	0.0647		0.0492 U	0.0838	0.0465 U	0.059	0.0539 U	0.0599 U

Notes:

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(a) - Calculated in
accordance with the steps
outlined in Section 3.1.3
and 4.4 of the human
health risk assessment.
Note that totals are not
presented for duplicates;
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sample is the average total
of the sample and the
duplicate.

TABLE B-2
 CALCULATION OF TOTAL PCBs
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Creek segment Sample	D CBS-CSD-T2-1	D CBS-CSD-T3-1	D CBS-CSD-T4-1	D CBS-CSD-T5-1	D CBS-CSD-T6-1	E CBS-CSE-T1-1	E CBS-CSE-T10-1	E CBS-CSE-T11-1
Sample date	12/12/2001	12/12/2001	12/12/2001	12/12/2001	12/12/2001	12/18/2001	12/19/2001	12/19/2001
Units Analyte:	mg/kg	mg/kg						
Decachlorobiphenyl	0.059	0.004 J	0.025 U	0.023 U	0.19	0.0074 J	0.023 UJ	0.0079 J
Dichlorobiphenyl	0.005 U	0.0047 U	0.0049 U	0.0045 U	0.0048 U	0.0049 U	0.0046 UJ	0.0048 U
Heptachlorobiphenyl	0.026	0.014 U	0.015 U	0.014 U	0.19	0.015 U	0.014 UJ	0.015 U
Hexachlorobiphenyl	0.063	0.0015 J	0.0033 J	0.0027 J	0.62	0.0067 J	0.0093 UJ	0.01
Monochlorobiphenyl	0.0039 J	0.0047 U	0.0049 U	0.0045 U	0.0048 U	0.0049 U	0.0046 UJ	0.0048 U
Nonachlorobiphenyl	0.016 J	0.024 U	0.025 U	0.023 U	0.039	0.025 U	0.023 UJ	0.024 U
Octachlorobiphenyl	0.0099 J	0.014 U	0.015 U	0.014 U	0.05	0.015 U	0.014 UJ	0.015 U
Pentachlorobiphenyl	0.06	0.0044 J	0.0057 J	0.0047 J	1	0.0091 J	0.0093 UJ	0.018
Tetrachlorobiphenyl	0.033	0.0096 U	0.01 U	0.0092 U	0.34	0.01 U	0.0093 UJ	0.0098 U
Trichlorobiphenyl	0.021	0.0047 U	0.0049 U	0.0045 U	0.0082	0.0049 U	0.0046 UJ	0.0048 U
Total PCBs (a)	0.2918	0.0454	0.0589	0.0535	2.4396	0.0606	0.05555 U	0.0726

Notes:

J - Detected, estimated.

U - Nondetected.

UJ - Nondetected,
detection limit is estimated.

R - Rejected.

(a) - Calculated in
accordance with the steps
outlined in Section 3.1.3
and 4.4 of the human
health risk assessment.
Note that totals are not
presented for duplicates;
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sample is the average total
of the sample and the
duplicate.

TABLE B-2
 CALCULATION OF TOTAL PCBs
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Creek segment Sample	E CBS-CSE-T12-1	E CBS-CSE-T13-2	E CBS-CSE-T14-1	E CBS-CSE-T15-1	E CBS-CSE-T15-1-FD	E CBS-CSE-T16-1	E CBS-CSE-T17-1	E CBS-CSE-T2-1
Sample date	12/19/2001	2/14/2002	12/18/2001	12/18/2001	12/18/2001	12/21/2001	12/21/2001	12/18/2001
Units Analyte:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Decachlorobiphenyl	0.026 U	0.064	0.024 U	0.021 U	0.021 U	0.18	0.017 J	0.022 U
Dichlorobiphenyl	0.0051 U	0.0049 U	0.0048 U	0.0042 U	0.0042 U	0.0057 J	0.0058 U	0.0044 U
Heptachlorobiphenyl	0.015 U	0.041	0.015 U	0.013 U	0.013 U	0.064 J	0.0059 J	0.014 U
Hexachlorobiphenyl	0.01 U	0.24	0.0098 U	0.0085 U	0.0086 U	0.082 J	0.012	0.0095
Monochlorobiphenyl	0.0051 U	0.0049 U	0.0048 U	0.0042 U	0.0042 U	0.0067 UJ	0.0058 U	0.0044 U
Nonachlorobiphenyl	0.026 U	0.035	0.024 U	0.021 U	0.021 U	0.094	0.0039 J	0.022 U
Octachlorobiphenyl	0.015 U	0.016	0.015 U	0.013 U	0.013 U	0.032	0.018 U	0.014 U
Pentachlorobiphenyl	0.01 U	0.38 J	0.0098 U	0.0085 U	0.0086 U	0.57 J	0.061	0.018
Tetrachlorobiphenyl	0.01 U	0.14	0.0098 U	0.0085 U	0.0086 U	0.16 J	0.0036 J	0.0024 J
Trichlorobiphenyl	0.0051 U	0.0011 J	0.0048 U	0.0042 U	0.0042 U	0.064 J	0.0058 U	0.0044 U
Total PCBs (a)	0.0611 U	0.91955	0.0585 U	0.051025 U		1.2517	0.1182	0.0703

Notes:

J - Detected, estimated.

U - Nondetected.

UJ - Nondetected,
detection limit is estimated.

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(a) - Calculated in
accordance with the steps
outlined in Section 3.1.3
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Note that totals are not
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duplicate.

TABLE B-2
 CALCULATION OF TOTAL PCBs
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Creek segment Sample	E CBS-CSE-T3-1	E CBS-CSE-T3-1-FD	E CBS-CSE-T4-1	E CBS-CSE-T5-1	E CBS-CSE-T6-1	E CBS-CSE-T7-1	E CBS-CSE-T8-1	E CBS-CSE-T9-1
Sample date	12/18/2001	12/18/2001	12/18/2001	12/18/2001	12/18/2001	12/19/2001	12/19/2001	12/19/2001
Units Analyte:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Decachlorobiphenyl	0.024 U	0.024 U	0.023 U	0.022 U	0.0084 J	0.024 U	0.0062 J	0.025 U
Dichlorobiphenyl	0.0048 U	0.0046 U	0.0046 U	0.0043 U	0.0047 U	0.0048 U	0.0052 U	0.0049 U
Heptachlorobiphenyl	0.015 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U	0.016 U	0.015 U
Hexachlorobiphenyl	0.0098 U	0.0094 U	0.0093 U	0.0013 J	0.018	0.0097 U	0.0077 J	0.01 U
Monochlorobiphenyl	0.0048 U	0.0046 U	0.0046 U	0.0043 U	0.0047 U	0.0048 U	0.0052 U	0.0049 U
Nonachlorobiphenyl	0.024 U	0.024 U	0.023 U	0.022 U	0.024 U	0.024 U	0.026 U	0.025 U
Octachlorobiphenyl	0.015 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U	0.016 U	0.015 U
Pentachlorobiphenyl	0.0044 J	0.0025 J	0.0093 U	0.0011 J	0.046	0.0097 U	0.015	0.01 U
Tetrachlorobiphenyl	0.0098 U	0.0094 U	0.0093 U	0.0087 U	0.012	0.0097 U	0.011 U	0.01 U
Trichlorobiphenyl	0.0048 U	0.0046 U	0.0046 U	0.0043 U	0.0011 J	0.0048 U	0.0052 U	0.0049 U
Total PCBs (a)	0.05625		0.05555 U	0.04605	0.11385	0.05735 U	0.0686	0.0599 U

Notes:

J - Detected, estimated.

U - Nondetected.

UJ - Nondetected,
detection limit is estimated.

R - Rejected.

(a) - Calculated in
accordance with the steps
outlined in Section 3.1.3
and 4.4 of the human
health risk assessment.
Note that totals are not
presented for duplicates;
the total for the parent
sample is the average total
of the sample and the
duplicate.

TABLE B-2
 CALCULATION OF TOTAL PCBs
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Creek segment Sample	F CBS-CSF-T1-1	F CBS-CSF-T10-1	F CBS-CSF-T11-1	F CBS-CSF-T12-1	F CBS-CSF-T13-1	F CBS-CSF-T14-1	F CBS-CSF-T15-1	F CBS-CSF-T15-1-FD
Sample date	12/21/2001	1/25/2002	1/25/2002	1/23/2002	1/16/2002	1/8/2002	1/8/2002	1/8/2002
Units Analyte:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Decachlorobiphenyl	0.028 U	0.022 U	0.023 U	0.022 U	0.022 U	0.0061 J	0.0062 J	0.01 J
Dichlorobiphenyl	0.0055 U	0.0043 U	0.0046 U	0.0044 U	0.0044 U	0.0044 U	0.0047 U	0.0043 U
Heptachlorobiphenyl	0.017 U	0.013 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U	0.013 U
Hexachlorobiphenyl	0.011 U	0.0087 U	0.0093 U	0.009 U	0.0089 U	0.0079 J	0.0065 J	0.0067 J
Monochlorobiphenyl	0.0055 U	0.0043 U	0.0046 U	0.0044 U	0.0044 U	0.0044 U	0.0047 U	0.0043 U
Nonachlorobiphenyl	0.028 U	0.022 U	0.023 U	0.022 U	0.022 U	0.022 U	0.024 U	0.0033 J
Octachlorobiphenyl	0.017 U	0.013 U	0.014 U	0.014 U	0.013 U	0.014 U	0.014 U	0.013 U
Pentachlorobiphenyl	0.011 U	0.0087 U	0.0093 U	0.009 U	0.0089 U	0.011	0.0058 J	0.0039 J
Tetrachlorobiphenyl	0.011 U	0.0087 U	0.0093 U	0.009 U	0.0089 U	0.009 U	0.0096 U	0.0088 U
Trichlorobiphenyl	0.0055 U	0.0043 U	0.0046 U	0.0044 U	0.0044 U	0.0044 U	0.0047 U	0.0043 U
Total PCBs (a)	0.0445 U	0.04585 U	0.04855 U	0.0469 U	0.04625 U	0.0519	0.04305	

Notes:

J - Detected, estimated.

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UJ - Nondetected,
detection limit is estimated.

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(a) - Calculated in
accordance with the steps
outlined in Section 3.1.3
and 4.4 of the human
health risk assessment.
Note that totals are not
presented for duplicates;
the total for the parent
sample is the average total
of the sample and the
duplicate.

TABLE B-2
 CALCULATION OF TOTAL PCBs
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Creek segment Sample	F CBS-CSF-T16-1	F CBS-CSF-T2-1	F CBS-CSF-T3-1	F CBS-CSF-T4-1	F CBS-CSF-T5-1	F CBS-CSF-T6-1	F CBS-CSF-T6-1-FD	F CBS-CSF-T7-1
Sample date	2/6/2002	12/11/2001	12/11/2001	12/11/2001	1/8/2002	1/16/2002	1/16/2002	1/16/2002
Units Analyte:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Decachlorobiphenyl	0.024 U	0.024 U	0.032	0.023 U	0.023 U	0.025 U	0.024 U	0.023 U
Dichlorobiphenyl	0.0047 U	0.0048 U	0.0051 U	0.0045 U	0.0046 U	0.0049 U	0.0047 U	0.0046 U
Heptachlorobiphenyl	0.014 U	0.015 U	0.016	0.014 U	0.014 U	0.015 U	0.014 U	0.014 U
Hexachlorobiphenyl	0.0096 U	0.0098 U	0.07	0.0092 U	0.0093 U	0.0047 J	0.0079 J	0.0049 J
Monochlorobiphenyl	0.0047 U	0.0048 U	0.0056	0.0045 U	0.0046 U	0.0049 U	0.0047 U	0.0046 U
Nonachlorobiphenyl	0.024 U	0.024 U	0.013 J	0.023 U	0.023 U	0.025 U	0.024 U	0.023 U
Octachlorobiphenyl	0.014 U	0.015 U	0.0062 J	0.014 U	0.014 U	0.015 U	0.014 U	0.014 U
Pentachlorobiphenyl	0.0096 U	0.0098 U	0.13	0.0092 U	0.0093 U	0.0087 J	0.017	0.0091 J
Tetrachlorobiphenyl	0.0096 U	0.0098 U	0.077	0.0092 U	0.0093 U	0.002 J	0.0079 J	0.0093 U
Trichlorobiphenyl	0.0047 U	0.0048 U	0.0071	0.0045 U	0.001 J	0.0049 U	0.0047 U	0.0046 U
Total PCBs (a)	0.0501 U	0.051 U	0.3569	0.0483 U	0.04725	0.06065		0.05325

Notes:

J - Detected, estimated.

U - Nondetected.

UJ - Nondetected,
detection limit is estimated.

R - Rejected.

(a) - Calculated in
accordance with the steps
outlined in Section 3.1.3
and 4.4 of the human
health risk assessment.
Note that totals are not
presented for duplicates;
the total for the parent
sample is the average total
of the sample and the
duplicate.

TABLE B-2
 CALCULATION OF TOTAL PCBs
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Creek segment Sample	F CBS-CSF-T8-1	F CBS-CSF-T9-1	F CBS-CSF-T9-1-FD	SITE M SED-M-S10 0-6	SITE M SED-M-S2 0-6	SITE M SED-M-S3-(0-6)	SITE M SED-M-S4-(0-6)	SITE M SED-M-S5 0-6
Sample date	1/23/2002	1/23/2002	1/23/2002	6/22/2001	6/22/2001	7/10/2001	8/1/2001	6/22/2001
Units Analyte:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Decachlorobiphenyl	0.023 U	0.0031 J	0.0033 J	0.52	0.024	0.28	0.15 J	0.03
Dichlorobiphenyl	0.0045 U	0.0049 U	0.0043 U	0.12	0.0045 U	0.16	0.038	0.0041 U
Heptachlorobiphenyl	0.014 U	0.015 U	0.013 U	1.1	0.013 J	0.078	0.23 J	0.054
Hexachlorobiphenyl	0.0092 U	0.0034 J	0.0033 J	0.52	0.065	0.088	0.045 J	0.11
Monochlorobiphenyl	0.0045 U	0.0049 U	0.0043 U	0.068	0.0045 U	0.066	0.0043 U	0.0041 U
Nonachlorobiphenyl	0.023 U	0.025 U	0.022 U	0.13 J	0.023 U	0.17	0.041	0.011 J
Octachlorobiphenyl	0.014 U	0.015 U	0.013 U	0.14 J	0.014 U	0.065	0.079 J	0.015
Pentachlorobiphenyl	0.0092 U	0.0032 J	0.0014 J	15	0.22	0.096	0.93	0.3
Tetrachlorobiphenyl	0.0092 U	0.01 U	0.0088 U	8.6	0.17	0.13	2	0.4
Trichlorobiphenyl	0.0045 U	0.0049 U	0.0043 U	0.94	0.04	0.16	0.81	0.083
Total PCBs (a)	0.0483 U	0.0369		27.138	0.555	1.293	4.32515	1.0071

Notes:

J - Detected, estimated.

U - Nondetected.

UJ - Nondetected,
detection limit is estimated.

R - Rejected.

(a) - Calculated in
accordance with the steps
outlined in Section 3.1.3
and 4.4 of the human
health risk assessment.
Note that totals are not
presented for duplicates;
the total for the parent
sample is the average total
of the sample and the
duplicate.

TABLE B-2
 CALCULATION OF TOTAL PCBs
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Creek segment Sample	SITE M SED-M-S6-(0-6)	SITE M SED-M-S7-(0-6)	SITE M SED-M-S7-FD(0-6)	SITE M SED-M-S8 0-6	SITE M SED-M-S9-(0-6)
Sample date	7/10/2001	8/1/2001	8/1/2001	6/22/2001	7/10/2001
Units Analyte:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Decachlorobiphenyl	0.035	0.2 J	0.15 J	0.1	0.14
Dichlorobiphenyl	0.0049	0.085 U	0.086 U	0.041	0.0033 J
Heptachlorobiphenyl	0.1 J	0.46	0.26	0.11	0.23
Hexachlorobiphenyl	0.14 J	0.48	0.36	0.11	0.29
Monochlorobiphenyl	0.0042 U	0.085 U	0.086 U	0.029	0.0041 U
Nonachlorobiphenyl	0.022	0.067 J	0.023 J	0.057	0.052
Octachlorobiphenyl	0.037	0.16 J	0.12 J	0.027	0.061
Pentachlorobiphenyl	0.47	3.1	2.4	0.67	0.95
Tetrachlorobiphenyl	0.86	3.8	2.7	0.28	0.57
Trichlorobiphenyl	0.055 J	1.7	1.1	0.13	0.06
Total PCBs (a)	1.726	10.052	7.199	1.554	2.35835

Notes:

J - Detected, estimated.

U - Nondetected.

UJ - Nondetected,
 detection limit is estimated.

R - Rejected.

(a) - Calculated in
 accordance with the steps
 outlined in Section 3.1.3
 and 4.4 of the human
 health risk assessment.
 Note that totals are not
 presented for duplicates;
 the total for the parent
 sample is the average total
 of the sample and the
 duplicate.

TABLE B-3
CALULATION OF TCDD-TEQ
SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
HUMAN HEALTH RISK ASSESSMENT

Creek segment Sample	B CBS-CSB-T0-C1	B CBS-CSB-T1-C1	B CBS-CSB-T1-E1	B CBS-CSB-T1-W1	B CBS-CSB-T2-C1	B CBS-CSB-T2-E1	B CBS-CSB-T2-W1	B CBS-CSB-T3-C1
Sample date	11/1/2001	10/31/2001	10/31/2001	10/31/2001	10/31/2001	10/31/2001	10/31/2001	10/31/2001
Units	mg/kg							
Analyte:								
1,2,3,4,6,7,8,9-OCDD	2.49	0.0021 J	0.025	0.0879	0.0015 J	0.0208	0.00032 J	0.0316
1,2,3,4,6,7,8,9-OCDF	0.517	0.0007 J	0.0053 J	0.0226	0.00017 J	0.0042 J	0.00006 J	0.0032 J
1,2,3,4,6,7,8-HxCDD	0.21	0.00021 J	0.0021 J	0.0071	0.00005 U	0.002 J	0.00005 U	0.0021 J
1,2,3,4,6,7,8-HpCDF	0.0686	0.00008 J	0.00067 J	0.0025 J	0.00003 U	0.00079 J	0.00003 U	0.0011 J
1,2,3,4,7,8,9-HpCDF	0.0056	0.00003 U	0.00006 J	0.00015 J	0.00004 U	0.00003 U	0.00003 U	0.00013 J
1,2,3,4,7,8-HxCDD	0.0015 J	0.00003 U	0.00003 U	0.00004 U	0.00003 U	0.00002 U	0.00003 U	0.00006 U
1,2,3,4,7,8-HxCDF	0.0063	0.00002 U	0.00003 J	0.00002 U	0.00002 U	0.00002 U	0.00002 U	0.00074 J
1,2,3,6,7,8-HxCDD	0.0065	0.00004 U	0.00007 J	0.00017 J	0.00004 U	0.00007 J	0.00004 U	0.00013 J
1,2,3,6,7,8-HxCDF	0.0029 J	0.00002 U	0.00002 U	0.00002 U	0.00003 U	0.00002 U	0.00002 U	0.0003 J
1,2,3,7,8,9-HxCDD	0.0025 J	0.00003 U	0.00003 J	0.00008 J	0.00003 U	0.00002 U	0.00003 U	0.00014 J
1,2,3,7,8,9-HxCDF	0.0008 U	0.00002 U	0.00002 U	0.00003 U	0.00003 U	0.00002 U	0.00003 U	0.00004 U
1,2,3,7,8-PeCDD	0.0015 J	0.00004 U	0.00004 U	0.00004 U	0.00005 U	0.00004 U	0.00005 U	0.00021 J
1,2,3,7,8-PeCDF	0.0001 U	0.00003 U	0.00002 U	0.00003 U	0.00003 U	0.00002 U	0.00003 U	0.00009 J
2,3,4,6,7,8-HxCDF	0.0007 U	0.00003 U	0.00002 U	0.00003 U	0.00003 U	0.00002 U	0.00003 U	0.00004 U
2,3,4,7,8-PeCDF	0.0001 U	0.00003 U	0.00002 U	0.00003 U	0.00003 U	0.00002 U	0.00003 U	0.00004 U
2,3,7,8-TCDD	0.0001 U	0.00003 U	0.00003 U	0.00003 U	0.00004 U	0.00002 U	0.00003 U	0.00005 U
2,3,7,8-TCDF	0.00009 U	0.00002 U	0.00003 U					
Total HpCDD	0.457	0.00042 J	0.0042	0.0137	0.00005 U	0.0039	0.00005 U	0.0036 J
Total HpCDF	0.393	0.00041 J	0.003 J	0.0102	0.00003 U	0.0029 J	0.00003 U	0.0025 J
Total HxCDD	0.139 J	0.00003 U	0.00031 J	0.001 J	0.00003 U	0.00042 J	0.00003 U	0.0011 J
Total HxCDF	0.0761	0.00005 J	0.0005 J	0.0012 J	0.00002 U	0.00081 J	0.00002 U	0.0024 J
Total PeCDD	0.0228 J	0.00004 U	0.00004 U	0.00018 J	0.00005 U	0.00004 U	0.00005 U	0.001 J
Total PeCDF	0.0036 J	0.00003 U	0.00002 U	0.00007 J	0.00003 U	0.00002 U	0.00003 U	0.00083 J
Total TCDD	0.0532 J	0.0032 UJ	0.0033 UJ	0.0035 UJ	0.0037 UJ	0.0034 UJ	0.0031 UJ	0.0055 UJ
Total TCDF	0.0058	0.00008 UJ	0.00007 UJ	0.00002 U	0.00008 UJ	0.00002 U	0.00006 UJ	0.00018 J
2,3,7,8-TCDD-TEQ	0.0045447	0.00004108	0.00007433	0.0001683	0.000044017	0.00006905	0.000043338	0.00039878

Notes:

J - Detected, estimated.

U - Nondetected.

UJ - Nondetected, detection limit is estimated.

R - Rejected.

(a) - Calculated in accordance with the steps outlined in Section 3.1.3 and 4.5 of the human health risk assessment.

Note that totals are not

presented for duplicates; the total for the parent sample is the average total of the sample and the duplicate.

TABLE B-3
CALULATION OF TCDD-TEQ
SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
HUMAN HEALTH RISK ASSESSMENT

Creek segment Sample	B CBS-CSB-T3-E1	B CBS-CSB-T3-W1	B CBS-CSB-T4-C1	B CBS-CSB-T4-E1	B CBS-CSB-T4-W1	B CBS-CSB-T5-C1	B CBS-CSB-T5-E1	B CBS-CSB-T5-W1
Sample date	10/31/2001	10/31/2001	11/1/2001	11/1/2001	11/1/2001	11/1/2001	11/1/2001	11/1/2001
Units	mg/kg							
Analyte:								
1,2,3,4,6,7,8,9-OCDD	0.483	0.0034 J	0.003 J	0.0073	0.00018 J	0.00072 J	0.0611	0.00023 J
1,2,3,4,6,7,8,9-OCDF	0.039	0.00062 J	0.00068 J	0.0012 J	0.00006 J	0.00019 J	0.0228	0.00007 U
1,2,3,4,6,7,8-HxCDD	0.0584	0.00027 J	0.00023 J	0.00055 J	0.00003 U	0.00004 U	0.0054	0.00004 U
1,2,3,4,6,7,8-HxCDF	0.0097	0.00007 U	0.00011 J	0.00026 J	0.00002 U	0.00003 U	0.0032 J	0.00002 U
1,2,3,4,7,8,9-HxCDF	0.00009 U	0.00008 U	0.00004 U	0.00002 U	0.00002 U	0.00003 U	0.00012 J	0.00003 U
1,2,3,4,7,8-HxCDD	0.00048 J	0.00007 U	0.00004 U	0.00002 U	0.00002 U	0.00003 U	0.00002 U	0.00002 U
1,2,3,4,7,8-HxCDF	0.00033 J	0.00005 U	0.00003 U	0.00001 U	0.00001 U	0.00002 U	0.00008 J	0.00002 U
1,2,3,6,7,8-HxCDD	0.0015 J	0.00009 U	0.00004 U	0.00002 U	0.00002 U	0.00003 U	0.0002 J	0.00003 U
1,2,3,6,7,8-HxCDF	0.00006 U	0.00006 U	0.00002 U	0.00001 U	0.00001 U	0.00002 U	0.00002 U	0.00002 U
1,2,3,7,8,9-HxCDD	0.0016 J	0.00008 U	0.00004 U	0.00002 U	0.00002 U	0.00003 U	0.00006 J	0.00002 U
1,2,3,7,8,9-HxCDF	0.00007 U	0.00006 U	0.00003 U	0.00002 U	0.00002 U	0.00003 U	0.00002 U	0.00002 U
1,2,3,7,8-PeCDD	0.00028 J	0.00007 U	0.00005 U	0.00003 U	0.00003 U	0.00004 U	0.00003 U	0.00003 U
1,2,3,7,8-PeCDF	0.00011 J	0.00005 U	0.00003 U	0.00002 U				
2,3,4,6,7,8-HxCDF	0.00007 U	0.00006 U	0.00003 U	0.00002 U				
2,3,4,7,8-PeCDF	0.00031 J	0.00005 U	0.00003 U	0.00002 U	0.00002 U	0.00003 U	0.00002 U	0.00002 U
2,3,7,8-TCDD	0.00006 U	0.00005 U	0.00003 U	0.00002 U				
2,3,7,8-TCDF	0.00063 J	0.00004 U	0.00002 U	0.00001 U	0.00001 U	0.00002 U	0.00004 J	0.00002 U
Total HpCDD	0.0986	0.00049 J	0.00043 J	0.0011 J	0.00003 U	0.00004 U	0.0102	0.00004 U
Total HpCDF	0.0415	0.00028 J	0.00042 J	0.00087 J	0.00002 U	0.00004 J	0.0138	0.00002 U
Total HxCDD	0.0101	0.00007 U	0.00004 U	0.0003 J	0.00002 U	0.00003 U	0.0013 J	0.00002 U
Total HxCDF	0.0214	0.00005 U	0.00013 J	0.00034 J	0.00001 U	0.00002 U	0.0027 J	0.00002 U
Total PeCDD	0.0028 J	0.00007 U	0.00005 U	0.00003 U	0.00003 U	0.00004 U	0.00059 J	0.00003 U
Total PeCDF	0.0019 J	0.00005 U	0.00003 U	0.00002 U	0.00002 U	0.00002 U	0.00022 J	0.00002 U
Total TCDD	0.0078 UJ	0.0028 UJ	0.0032 UJ	0.0027 UJ	0.0028 UJ	0.0028 UJ	0.0032 UJ	0.0026 UJ
Total TCDF	0.00063 J	0.0001 UJ	0.00009 UJ	0.00007 UJ	0.00009 UJ	0.00009 UJ	0.0002 UJ	0.0001 UJ
2,3,7,8-TCDD-TEQ	0.00163465	0.000075102	0.000048218	0.00003505	0.000026374	0.000037091	0.00015709	0.0000284765

Notes:

J - Detected, estimated.

U - Nondetected.

UJ - Nondetected, detection

limit is estimated.

R - Rejected.

(a) - Calculated in accordance with the steps outlined in Section 3.1.3 and 4.5 of the human health risk assessment.

Note that totals are not

presented for duplicates; the total for the parent sample is the average total of the sample and the duplicate.

TABLE B-3
CALULATION OF TCDD-TEQ
SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
HUMAN HEALTH RISK ASSESSMENT

Creek segment Sample	B CBS-CSB-T6-C1	B CBS-CSB-T6-C1-D	B CBS-CSB-T6-E1	B CBS-CSB-T6-W1	B CBS-CSB-T7-C1	B CBS-CSB-T7-E1	B CBS-CSB-T7-W1	B CBS-CSB-T8-C1
Sample date	11/8/2001	11/8/2001	11/8/2001	11/8/2001	11/8/2001	11/8/2001	11/8/2001	11/8/2001
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte:								
1,2,3,4,6,7,8,9-OCDD	0.014	0.011	0.0075	0.0011 J	0.00069 J	0.003 J	0.0166 J	0.00054 J
1,2,3,4,6,7,8,9-OCDF	0.0042 J	0.0046 J	0.00079 J	0.00039 J	0.00014 J	0.00024 J	0.0013 J	0.0002 J
1,2,3,4,6,7,8-HxCDD	0.0012 J	0.00091 J	0.00067 J	0.00013 J	0.00007 U	0.00011 J	0.0012 J	0.00008 U
1,2,3,4,6,7,8-HpCDF	0.00068 J	0.0006 J	0.00023 J	0.00006 J	0.00003 J	0.00006 J	0.00038 J	0.00004 J
1,2,3,4,7,8,9-HpCDF	0.00006 U	0.00007 U	0.00003 U	0.00005 U	0.00003 U	0.00004 U	0.00004 U	0.00004 U
1,2,3,4,7,8-HxCDD	0.00007 U	0.00008 U	0.00003 U	0.00005 U	0.00004 U	0.00004 U	0.00004 U	0.00005 U
1,2,3,4,7,8-HxCDF	0.00005 U	0.00006 U	0.00003 U	0.00004 U	0.00003 U	0.00003 U	0.00003 U	0.00003 U
1,2,3,6,7,8-HxCDD	0.00008 U	0.0001 U	0.00003 J	0.00006 U	0.00005 U	0.00005 U	0.00004 J	0.00006 U
1,2,3,6,7,8-HxCDF	0.00005 U	0.00006 U	0.00003 U	0.00004 U	0.00003 U	0.00003 U	0.00003 U	0.00003 U
1,2,3,7,8,9-HxCDD	0.00007 U	0.00008 U	0.00003 J	0.00005 U	0.00004 U	0.00004 U	0.00004 U	0.00005 U
1,2,3,7,8,9-HxCDF	0.00005 U	0.00007 U	0.00003 U	0.00005 U	0.00003 U	0.00003 U	0.00003 U	0.00003 U
1,2,3,7,8-PeCDD	0.0001 U	0.0001 U	0.00008 U	0.00008 U	0.00008 U	0.00009 U	0.00007 U	0.00009 U
1,2,3,7,8-PeCDF	0.00009 U	0.0001 U	0.00005 U	0.00005 U	0.00005 U	0.00006 U	0.00004 U	0.00006 U
2,3,4,6,7,8-HxCDF	0.00006 U	0.00007 U	0.00003 U	0.00005 U	0.00003 U	0.00004 U	0.00004 U	0.00004 U
2,3,4,7,8-PeCDF	0.00001 U	0.0001 U	0.00005 U	0.00005 U	0.00005 U	0.00006 U	0.00004 U	0.00006 U
2,3,7,8-TCDD	0.00009 U	0.00009 U	0.00005 U	0.00005 U	0.00006 U	0.00006 U	0.00004 U	0.00006 U
2,3,7,8-TCDF	0.00007 U	0.00009 U	0.00004 U	0.00004 U	0.00004 U	0.00004 U	0.00003 U	0.00004 U
Total HpCDD	0.0023 J	0.0017 J	0.0014 J	0.00024 J	0.00007 U	0.00024 J	0.0023 J	0.00008 U
Total HpCDF	0.0023 J	0.0018 J	0.00066 J	0.00022 J	0.00009 J	0.00017 J	0.0012 J	0.00013 J
Total HxCDD	0.00019 J	0.00031 J	0.00022 J	0.00005 U	0.00004 U	0.00004 U	0.00032 J	0.00005 U
Total HxCDF	0.00048 J	0.00023 J	0.00045 J	0.00004 U	0.00003 U	0.00003 U	0.00058 J	0.00003 U
Total PeCDD	0.0001 U	0.0001 U	0.00008 J	0.00008 U	0.00008 U	0.00009 U	0.00007 U	0.00009 U
Total PeCDF	0.00009 U	0.0001 U	0.00005 U	0.00005 U	0.00005 U	0.00006 U	0.00004 U	0.0011 J
Total TCDD	0.0029 UJ	0.0024 UJ	0.0024 UJ	0.0031 UJ	0.0029 UJ	0.0027 UJ	0.0026 UJ	0.0031 UJ
Total TCDF	0.00007 U	0.00013 J	0.00047 J	0.00004 U	0.00007 J	0.00006 J	0.00007 J	0.00008 J
2,3,7,8-TCDD-TEQ	0.00012109		0.000077729	0.000072549	0.000067633	0.000077224	0.00007829	0.000077574

Notes:

J - Detected, estimated.

U - Nondetected.

UJ - Nondetected, detection

limit is estimated.

R - Rejected.

(a) - Calculated in accordance with the steps outlined in Section 3.1.3 and 4.5 of the human health risk assessment.

Note that totals are not presented for duplicates; the total for the parent sample is the average total of the sample and the duplicate.

TABLE B-3
CALULATION OF TCDD-TEQ
SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
HUMAN HEALTH RISK ASSESSMENT

Creek segment Sample	B CBS-CSB-T8-E1	B CBS-CSB-T8-W1	B CBS-CSB-T9-C1	B CBS-CSB-T9-E1	B CBS-CSB-T9-W1	B CBS-CSB-T10-C1	B CBS-CSB-T10-E1	B CBS-CSB-T10-W1
Sample date	11/8/2001	11/8/2001	11/8/2001	11/8/2001	11/8/2001	11/8/2001	11/8/2001	11/8/2001
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte:								
1,2,3,4,6,7,8,9-OCDD	0.0029 J	0.0071	0.00017 J	0.0054 J	0.0092	0.0011 J	0.0237	0.0138
1,2,3,4,6,7,8,9-OCDF	0.00046 J	0.00063 J	0.00004 J	0.0014 J	0.0011 J	0.00054 J	0.0103	0.0042 J
1,2,3,4,6,7,8-HxCDD	0.00018 J	0.00065 J	0.00002 U	0.00052 J	0.00093 J	0.0001 J	0.0025 J	0.0015 J
1,2,3,4,6,7,8-HpCDF	0.00011 J	0.00023 J	0.000009 U	0.00036 J	0.00034 J	0.00009 J	0.0017 J	0.00097 J
1,2,3,4,7,8,9-HpCDF	0.00001 U	0.00007 J	0.00002 U					
1,2,3,4,7,8-HxCDD	0.00001 U	0.00002 U	0.00002 U					
1,2,3,4,7,8-HxCDF	0.000007 U	0.000008 U	0.000007 U	0.000008 U	0.000007 U	0.000007 U	0.00004 J	0.00002 J
1,2,3,6,7,8-HxCDD	0.00001 U	0.00003 J	0.00001 U	0.00001 U	0.00003 J	0.00001 U	0.00009 J	0.00006 J
1,2,3,6,7,8-HxCDF	0.000007 U	0.000007 U	0.000006 U	0.000008 U	0.000007 U	0.000007 U	0.000009 U	0.00001 U
1,2,3,7,8,9-HxCDD	0.00001 U	0.00001 U	0.00001 U	0.00001 U	0.00002 J	0.00001 U	0.00002 U	0.00004 J
1,2,3,7,8,9-HxCDF	0.000008 U	0.000009 U	0.000007 U	0.000009 U	0.000008 U	0.000008 U	0.00001 U	0.00001 U
1,2,3,7,8-PeCDD	0.00002 U	0.00003 U	0.00003 U					
1,2,3,7,8-PeCDF	0.00001 U	0.00002 U	0.00002 U	0.00002 U				
2,3,4,6,7,8-HxCDF	0.000008 U	0.000009 U	0.000008 U	0.00001 U	0.000008 U	0.000008 U	0.00001 U	0.00001 U
2,3,4,7,8-PeCDF	0.00002 U	0.00002 U	0.00001 U	0.00002 U	0.00002 U	0.00002 U	0.00002 U	0.00003 U
2,3,7,8-TCDD	0.00001 U	0.00002 U	0.00002 U					
2,3,7,8-TCDF	0.00001 U	0.00001 U	0.00002 U					
Total HpCDD	0.00037 J	0.0012 J	0.00002 U	0.0011 J	0.0018 J	0.0002 J	0.0047	0.0028 J
Total HpCDF	0.00034 J	0.00069 J	0.00009 U	0.0011 J	0.001 J	0.0004 J	0.0064	0.0029 J
Total HxCDD	0.00002 J	0.00016 J	0.00001 U	0.00018 J	0.00027 J	0.00007 J	0.00059 J	0.00048 J
Total HxCDF	0.00007 J	0.00022 J	0.00006 U	0.00023 J	0.00036 J	0.00004 J	0.0011 J	0.0008 J
Total PeCDD	0.00002 U	0.00002 U	0.00002 U	0.00007 J	0.00002 U	0.00002 U	0.00028 J	0.00028 J
Total PeCDF	0.00001 U	0.00002 U	0.00012 J	0.00005 J				
Total TCDD	0.0025 UJ	0.0024 UJ	0.0026 UJ	0.0024 UJ	0.0023 UJ	0.0027 UJ	0.0031 U	0.0025 UJ
Total TCDF	0.00007 J	0.00006 J	0.00006 J	0.00007 J	0.00007 J	0.00007 J	0.00006 J	0.00007 J
2,3,7,8-TCDD-TEQ	0.000021636	0.000030573	0.000016016	0.00002808	0.00003613	0.000020714	0.00008305	0.0000646

Notes:

J - Detected, estimated.

U - Nondetected.

UJ - Nondetected, detection limit is estimated.

R - Rejected.

(a) - Calculated in accordance with the steps outlined in Section 3.1.3 and 4.5 of the human health risk assessment.

Note that totals are not presented for duplicates; the total for the parent sample is the average total of the sample and the duplicate.

TABLE B-3
CALULATION OF TCDD-TEQ
SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
HUMAN HEALTH RISK ASSESSMENT

Creek segment Sample	B CBS-CSB-T11-C1	B CBS-CSB-T11-C1-D	B CBS-CSB-T11-E1	B CBS-CSB-T11-W1	B CBS-CSB-T12-C1	B CBS-CSB-T12-E1	B CBS-CSB-T12-W1	B CBS-CSB-T13-C1
Sample date	11/19/2001	11/19/2001	11/19/2001	11/19/2001	11/19/2001	11/19/2001	11/19/2001	11/19/2001
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte:								
1,2,3,4,6,7,8,9-OCDD	0.0298	0.117	0.0072	0.0159	0.00084 J	0.0101	0.012	0.0011 J
1,2,3,4,6,7,8,9-OCDF	0.0094	0.0587	0.002 J	0.0017 J	0.00048 J	0.0029 J	0.0018 J	0.0003 J
1,2,3,4,6,7,8-HxCDD	0.0027 J	0.0145	0.00064 J	0.0016 J	0.0003 J	0.00086 J	0.001 J	0.00008 J
1,2,3,4,6,7,8-HpCDF	0.0013 J	0.0079	0.0005 J	0.00044 J	0.00017 J	0.00064 J	0.00036 J	0.00004 J
1,2,3,4,7,8,9-HpCDF	0.00003 U	0.00042 J	0.00003 U	0.00003 U	0.00037 J	0.00003 U	0.00001 U	0.00001 U
1,2,3,4,7,8-HxCDD	0.00003 U	0.00002 U	0.00003 U	0.00003 U	0.00004 U	0.00004 J	0.00003 J	0.00001 U
1,2,3,4,7,8-HxCDF	0.00002 U	0.00015 J	0.00002 U	0.00002 U	0.00017 J	0.00002 U	0.00006 U	0.000007 U
1,2,3,6,7,8-HxCDD	0.00009 J	0.00034 J	0.00004 U	0.00006 J	0.00005 U	0.00003 U	0.00002 J	0.00001 U
1,2,3,6,7,8-HxCDF	0.00002 U	0.00002 U	0.00002 U	0.00002 U	0.00004 U	0.00002 U	0.000006 U	0.000007 U
1,2,3,7,8,9-HxCDD	0.00003 U	0.00005 J	0.00003 U	0.00003 U	0.00015 J	0.00002 U	0.00003 J	0.00001 U
1,2,3,7,8,9-HxCDF	0.00002 U	0.00001 U	0.00002 U	0.00002 U	0.00003 U	0.00002 U	0.00007 U	0.000008 U
1,2,3,7,8-PeCDD	0.00004 U	0.00003 U	0.00004 U	0.00004 U	0.00009 J	0.00003 U	0.00002 U	0.00002 U
1,2,3,7,8-PeCDF	0.00002 U	0.00002 U	0.00003 U	0.00003 U	0.00008 J	0.00002 U	0.00001 U	0.00001 U
2,3,4,6,7,8-HxCDF	0.00002 U	0.00001 U	0.00002 U	0.00002 U	0.00003 U	0.00002 U	0.00007 U	0.000008 U
2,3,4,7,8-PeCDF	0.00003 U	0.00002 U	0.00003 U	0.00003 U	0.00014 J	0.00003 U	0.00001 U	0.00001 U
2,3,7,8-TCDD	0.00002 U	0.00001 U	0.00002 U	0.00002 U	0.00002 U	0.00002 U	0.00001 U	0.00001 U
2,3,7,8-TCDF	0.00002 U	0.00006 J	0.00002 U	0.00002 U	0.00018 J	0.00002 J	0.000008 U	0.000008 U
Total HpCDD	0.0048	0.0257	0.0013 J	0.003 J	0.00051 J	0.0018 J	0.0022 J	0.00016 J
Total HpCDF	0.005	0.0374	0.0015 J	0.0016 J	0.00054 J	0.002 J	0.0012 J	0.00016 J
Total HxCDD	0.00039 J	0.0027 J	0.00044 J	0.00057 J	0.0006 J	0.00069 J	0.00049 J	0.00001 U
Total HxCDF	0.00089 J	0.0052 J	0.00046 J	0.00072 J	0.0014 J	0.00057 J	0.00055 J	0.000007 U
Total PeCDD	0.00016 J	0.0016 J	0.00004 U	0.00017 J	0.00061 J	0.00022 J	0.00024 J	0.00002 U
Total PeCDF	0.00002 U	0.00016 J	0.00003 U	0.00003 U	0.00048 J	0.0002 J	0.00001 U	0.00001 U
Total TCDD	0.0033 UJ	0.0066 UJ	0.0024 UJ	0.0032 UJ	0.0036 UJ	0.0023 UJ	0.0027 UJ	0.0026 UJ
Total TCDF	0.00011 UJ	0.0002 UJ	0.00008 UJ	0.00008 UJ	0.0011 J	0.00007 UJ	0.00006 UJ	0.00009 UJ
2,3,7,8-TCDD-TEQ	0.00020842		0.00004972	0.00006356	0.000230532	0.00005095	0.00003713	0.00001714

Notes:

J - Detected, estimated.

U - Nondetected.

UJ - Nondetected, detection limit is estimated.

R - Rejected.

(a) - Calculated in accordance with the steps outlined in Section 3.1.3 and 4.5 of the human health risk assessment.

Note that totals are not

presented for duplicates; the total for the parent sample is the average total of the sample and the duplicate.

TABLE B-3
CALULATION OF TCDD-TEQ
SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
HUMAN HEALTH RISK ASSESSMENT

Creek segment Sample	B CBS-CSB-T13-E1	B CBS-CSB-T13-W1	B CBS-CSB-T14-1	B CBS-CSB-T15-1	B CBS-CSB-T16-1	B CBS-CSB-T17-C1	B CBS-CSB-T17-E1	B CBS-CSB-T17-E1D
Sample date	11/19/2001	11/19/2001	12/20/2001	12/20/2001	12/20/2001	11/9/2001	11/9/2001	11/9/2001
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte:								
1,2,3,4,6,7,8,9-OCDD	0.0023 J	0.0034 J	0.0023 J	0.0107	0.298 J	0.00074 J	0.41	0.0832
1,2,3,4,6,7,8,9-OCDF	0.00036 J	0.00063 J	0.00036 U	0.0024 J	0.115	0.0001 J	0.238	0.0311
1,2,3,4,6,7,8-HxCDD	0.00013 J	0.0003 J	0.00023 J	0.0011 J	0.0282	0.00003 U	0.0392	0.0072
1,2,3,4,6,7,8-HpCDF	0.00009 J	0.00016 J	0.00009 J	0.00037 J	0.0155	0.00002 U	0.0215	0.0037
1,2,3,4,7,8,9-HpCDF	0.00001 U	0.00002 U	0.00002 U	0.00003 U	0.00095 J	0.00002 U	0.0005 U	0.0002 U
1,2,3,4,7,8-HxCDD	0.00001 U	0.00001 U	0.00003 U	0.00003 U	0.00002 U	0.00002 U	0.0003 U	0.0001 U
1,2,3,4,7,8-HxCDF	0.000008 U	0.00001 U	0.00001 U	0.00002 U	0.00041 J	0.00001 U	0.0002 U	0.00009 U
1,2,3,6,7,8-HxCDD	0.00001 U	0.00002 U	0.00003 U	0.00003 U	0.00099 J	0.00002 U	0.0116 J	0.0002 U
1,2,3,6,7,8-HxCDF	0.000007 U	0.000009 U	0.00002 U	0.00002 U	0.00013 J	0.00001 U	0.0003 U	0.0001 U
1,2,3,7,8,9-HxCDD	0.00001 U	0.00001 U	0.00003 U	0.00003 U	0.00017 J	0.00002 U	0.0004 U	0.0002 U
1,2,3,7,8,9-HxCDF	0.000009 U	0.00001 U	0.00002 U	0.00002 U	0.00002 U	0.00001 U	0.0003 U	0.0001 U
1,2,3,7,8-PeCDD	0.00002 U	0.00002 U	0.00003 U	0.00004 U	0.00058 J	0.00002 U	0.0002 U	0.0001 U
1,2,3,7,8-PeCDF	0.00001 U	0.00002 U	0.00002 U	0.00003 U	0.0014 J	0.00001 U	0.0001 U	0.00008 U
2,3,4,6,7,8-HxCDF	0.000008 U	0.00001 U	0.00002 U	0.00002 U	0.00018 J	0.00001 U	0.0003 U	0.0001 U
2,3,4,7,8-PeCDF	0.00001 U	0.00002 U	0.00003 U	0.00003 U	0.00019 J	0.00002 U	0.0001 U	0.00008 U
2,3,7,8-TCDD	0.00001 U	0.00001 U	0.00002 U	0.00002 U	0.00002 U	0.00001 U	0.0001 U	0.00008 U
2,3,7,8-TCDF	0.000009 U	0.00001 U	0.00002 U	0.00002 U	0.00018 J	0.00001 U	0.00007 U	0.00005 U
Total HpCDD	0.00033 J	0.00057 J	0.00048 J	0.0022 J	0.0554	0.00003 U	0.0726	0.0141
Total HpCDF	0.00028 J	0.00051 J	0.00023 J	0.0014 J	0.0736 J	0.00002 U	0.09	0.0147
Total HxCDD	0.00012 J	0.00015 J	0.00003 U	0.00029 J	0.0101 J	0.00002 U	0.0195 J	0.0012 J
Total HxCDF	0.00005 J	0.00018 J	0.00004 J	0.00033 J	0.0188	0.00001 U	0.0193 J	0.0035 J
Total PeCDD	0.00002 U	0.00002 U	0.00003 U	0.00004 U	0.0023 J	0.00002 U	0.0044 J	0.0029 J
Total PeCDF	0.00001 U	0.00002 U	0.00002 U	0.00003 U	0.0038 J	0.00001 U	0.0001 U	0.00087 J
Total TCDD	0.0023 UJ	0.0026 UJ	0.0024 UJ	0.0025 UJ	0.0109 J	0.0032 UJ	0.0292	0.0043 UJ
Total TCDF	0.00006 UJ	0.00006 UJ	0.00006 UJ	0.00008 UJ	0.005 J	0.00006 UJ	0.00007 U	0.00005 U
2,3,7,8-TCDD-TEQ	0.000018366	0.000024553	0.000034548	0.00005291	0.0014398	0.000020684	0.001137865	

Notes:

J - Detected, estimated.

U - Nondetected.

UJ - Nondetected, detection

limit is estimated.

R - Rejected.

(a) - Calculated in accordance with the steps outlined in Section 3.1.3 and 4.5 of the human health risk assessment.

Note that totals are not

presented for duplicates; the total for the parent sample is the average total of the sample and the duplicate.

TABLE B-3
CALULATION OF TCDD-TEQ
SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
HUMAN HEALTH RISK ASSESSMENT

Creek segment Sample	B CBS-CSB-T17-WI	B CBS-CSB-T18-C1	B CBS-CSB-T18-E1	B CBS-CSB-T18-W1	B CBS-CSB-T18-W1D	C CBS-CSC-T1-1	C CBS-CSC-T2-1	C CBS-CSC-T3-1
Sample date	11/9/2001	11/9/2001	11/9/2001	11/9/2001	11/9/2001	12/13/2001	12/13/2001	12/13/2001
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte:								
1,2,3,4,6,7,8,9-OCDD	0.00051 J	0.00046 J	0.0018 J	0.0019 J	0.0011 J	0.00074 J	0.0081	0.0006 J
1,2,3,4,6,7,8,9-OCDF	0.00001 U	0.00008 J	0.00034 J	0.0003 U	0.0003 U	0.00014 J	0.0027 J	0.00006 J
1,2,3,4,6,7,8-HxCDD	0.000008 U	0.00003 J	0.0001 UJ	0.0002 U	0.0001 U	0.00005 J	0.00055 J	0.00004 J
1,2,3,4,6,7,8-HpCDF	0.000005 U	0.00002 J	0.00009 U	0.0001 U	0.0001 U	0.00003 J	0.00036 J	0.00002 J
1,2,3,4,7,8,9-HpCDF	0.000006 U	0.00006 U	0.0001 U	0.0001 U	0.0001 U	0.00001 U	0.00001 U	0.00001 U
1,2,3,4,7,8-HxCDD	0.000005 U	0.00005 U	0.00007 U	0.00009 U	0.00007 U	0.00001 U	0.00001 U	0.00009 U
1,2,3,4,7,8-HxCDF	0.000004 U	0.00004 U	0.00005 U	0.00006 U	0.00006 U	0.000006 U	0.00001 J	0.000006 U
1,2,3,6,7,8-HxCDD	0.000006 U	0.00006 U	0.0001 U	0.0001 U	0.0001 U	0.00001 U	0.00002 J	0.00001 U
1,2,3,6,7,8-HxCDF	0.000004 U	0.00004 U	0.00006 U	0.00006 U	0.00006 U	0.000006 U	0.000006 U	0.000005 U
1,2,3,7,8,9-HxCDD	0.000005 U	0.00005 U	0.00009 U	0.0001 U	0.0001 U	0.00001 U	0.00001 U	0.00001 U
1,2,3,7,8,9-HxCDF	0.000004 U	0.00004 U	0.00006 U	0.00007 U	0.00007 U	0.000007 U	0.000007 U	0.000006 U
1,2,3,7,8-PeCDD	0.000009 U	0.00008 U	0.00006 U	0.00008 U	0.00007 U	0.00001 U	0.00002 U	0.00001 U
1,2,3,7,8-PeCDF	0.000006 U	0.00006 U	0.00004 U	0.00005 U	0.00004 U	0.00001 U	0.00001 U	0.00001 U
2,3,4,6,7,8-HxCDF	0.000004 U	0.00004 U	0.00006 U	0.00007 U	0.00006 U	0.000007 U	0.000007 U	0.000006 U
2,3,4,7,8-PeCDF	0.000008 U	0.00008 U	0.00004 UJ	0.00005 U	0.00004 U	0.00001 U	0.00001 U	0.00001 U
2,3,7,8-TCDD	0.000006 U	0.00005 U	0.00003 U	0.00004 U	0.00004 U	0.000008 U	0.00001 U	0.000008 U
2,3,7,8-TCDF	0.000005 U	0.00005 U	0.00002 U	0.00003 U	0.00003 U	0.000009 U	0.00001 U	0.000008 U
Total HpCDD	0.000008 U	0.00005 J	0.0001 U	0.0002 U	0.0001 U	0.00012 J	0.0012 J	0.0001 J
Total HpCDF	0.000005 U	0.00005 J	0.00009 U	0.0001 U	0.0001 U	0.0001 J	0.0012 J	0.00006 J
Total HxCDD	0.000005 U	0.00001 J	0.00007 U	0.00009 U	0.00007 U	0.00001 U	0.00029 J	0.00009 U
Total HxCDF	0.000004 U	0.00004 U	0.00005 U	0.00006 U	0.00006 U	0.00001 J	0.00015 J	0.00005 U
Total PeCDD	0.000009 U	0.00008 U	0.00006 U	0.00008 U	0.00007 U	0.00001 U	0.00015 J	0.00001 U
Total PeCDF	0.000006 U	0.00006 U	0.00004 U	0.00005 U	0.00004 U	0.00001 U	0.00001 U	0.00001 U
Total TCDD	0.0027 UJ	0.0027 UJ	0.003 UJ	0.0032 UJ	0.0034 UJ	0.0023 UJ	0.0025 UJ	0.0025 UJ
Total TCDF	0.00005 UJ	0.00004 UJ	0.00006 UJ	0.00003 U	0.00008 UJ	0.00007 UJ	0.00006 UJ	0.00006 UJ
2,3,7,8-TCDD-TEQ	0.0000084465	0.000008384	0.000065164	0.00007654		0.000003338	0.00001488	0.000002966

Notes:

J - Detected, estimated.

U - Nondetected.

UJ - Nondetected, detection

limit is estimated.

R - Rejected.

(a) - Calculated in accordance with the steps outlined in Section 3.1.3 and 4.5 of the human health risk assessment.

Note that totals are not

presented for duplicates; the total for the parent sample is the average total of the sample and the duplicate.

TABLE B-3
CALULATION OF TCDD-TEQ
SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
HUMAN HEALTH RISK ASSESSMENT

Creek segment Sample Sample date Units Analyte:	C CBS-CSC-T4-1 12/13/2001 mg/kg	C CBS-CSC-T4-1-FD 12/13/2001 mg/kg	C CBS-CSC-T5-1 12/13/2001 mg/kg	C CBS-CSC-T6-1 12/13/2001 mg/kg	C CBS-CSC-T7-1 12/13/2001 mg/kg	C CBS-CSC-T8-1 12/13/2001 mg/kg	C CBS-CSC-T9-1 12/13/2001 mg/kg	D CBS-CSD-T1-1 12/12/2001 mg/kg
1,2,3,4,6,7,8,9-OCDD	0.0235	0.0011 J	0.0012 J	0.0105	0.00069 J	0.0025 J	0.0031 J	0.0033 J
1,2,3,4,6,7,8,9-OCDF	0.0112	0.00041 J	0.0003 J	0.0025 J	0.00008 J	0.001 J	0.00054 J	0.00047 J
1,2,3,4,6,7,8-HxCDD	0.0023 J	0.0001 J	0.00009 J	0.00064 J	0.00002 U	0.00022 J	0.00018 J	0.00017 J
1,2,3,4,6,7,8-HxCDF	0.0023 J	0.00005 J	0.00006 J	0.00034 J	0.00002 J	0.00013 J	0.00008 J	0.0001 J
1,2,3,4,7,8,9-HxCDF	0.00005 J	0.00002 U	0.00001 U	0.00001 U	0.00002 U	0.00002 U	0.00001 U	0.00002 U
1,2,3,4,7,8-HxCDD	0.00001 U	0.00002 U	0.00002 U	0.00001 U	0.00002 U	0.00002 U	0.00001 U	0.00002 U
1,2,3,4,7,8-HxCDF	0.00003 J	0.00001 U	0.00001 U	0.00002 J	0.00001 U	0.00001 U	0.000007 U	0.00001 UJ
1,2,3,6,7,8-HxCDD	0.00006 J	0.00002 U	0.00002 U	0.00003 J	0.00002 U	0.00002 U	0.00001 U	0.00002 U
1,2,3,6,7,8-HxCDF	0.00001 J	0.00001 U	0.000008 U	0.000007 U	0.00001 U	0.000009 U	0.000006 U	0.00002 UJ
1,2,3,7,8,9-HxCDD	0.00003 J	0.00002 U	0.00002 U	0.00002 U	0.00002 U	0.00002 U	0.00001 U	0.00002 U
1,2,3,7,8,9-HxCDF	0.000007 U	0.00001 U	0.00001 U	0.000009 U	0.00001 U	0.00001 U	0.000008 U	0.00001 UJ
1,2,3,7,8-PeCDD	0.00002 U	0.00003 U	0.00002 U	0.00002 U	0.00002 U	0.00002 U	0.00002 U	0.00002 U
1,2,3,7,8-PeCDF	0.00001 U	0.00002 U	0.00002 U	0.00002 U	0.00002 U	0.00002 U	0.00001 U	0.00002 U
2,3,4,6,7,8-HxCDF	0.00002 J	0.00001 U	0.00001 U	0.000008 U	0.00001 U	0.00001 U	0.000008 U	0.00001 UJ
2,3,4,7,8-PeCDF	0.00001 U	0.00002 U	0.00002 U	0.00002 U	0.00002 U	0.00002 U	0.00001 U	0.00002 U
2,3,7,8-TCDD	0.00001 U	0.00002 U	0.00001 U	0.00001 U	0.00001 U	0.00001 U	0.00001 U	0.00001 U
2,3,7,8-TCDF	0.00002 J	0.00002 U	0.00001 U	0.00002 J	0.00001 U	0.00001 U	0.00001 U	0.00001 U
Total HpCDD	0.0044	0.00018 J	0.00022 J	0.0015 J	0.00002 U	0.00042 J	0.00046 J	0.00035 J
Total HpCDF	0.0081	0.00017 J	0.00018 J	0.0013 J	0.00005 J	0.00048 J	0.00028 J	0.00031 J
Total HxCDD	0.00066 J	0.00002 U	0.00002 U	0.00069 J	0.00002 U	0.00002 J	0.00004 J	0.00002 U
Total HxCDF	0.0104 J	0.00001 U	0.00002 J	0.00028 J	0.00001 U	0.00008 J	0.00004 J	0.00004 J
Total PeCDD	0.00039 J	0.00003 U	0.00002 U	0.00058 J	0.00002 U	0.00002 U	0.00002 U	0.00002 U
Total PeCDF	0.0027 J	0.00002 U	0.00002 U	0.00007 J	0.00002 U	0.00002 U	0.00001 U	0.00002 U
Total TCDD	0.0027 UJ	0.0027 UJ	0.0022 UJ	0.0029 UJ	0.0022 UJ	0.0025 UJ	0.0023 UJ	0.0024 UJ
Total TCDF	0.0002 J	0.00007 UJ	0.00006 UJ	0.00013 UJ	0.00007 UJ	0.00007 UJ	0.00006 UJ	0.00007 UJ
2,3,7,8-TCDD-TEQ	0.0000366105		0.0000056	0.0000199	0.000004477	0.0000079	0.000005564	0.000014677

Notes:

J - Detected, estimated.

U - Nondetected.

UJ - Nondetected, detection

limit is estimated.

R - Rejected.

(a) - Calculated in accordance with the steps outlined in Section 3.1.3 and 4.5 of the human health risk assessment.

Note that totals are not

presented for duplicates; the total for the parent sample is the average total of the sample and the duplicate.

TABLE B-3
CALULATION OF TCDD-TEQ
SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
HUMAN HEALTH RISK ASSESSMENT

Creek segment Sample	D CBS-CSD-T2-1	D CBS-CSD-T3-1	D CBS-CSD-T4-1	D CBS-CSD-T5-1	D CBS-CSD-T6-1	E CBS-CSE-T1-1	E CBS-CSE-T2-1	E CBS-CSE-T3-1
Sample date	12/12/2001	12/12/2001	12/12/2001	12/12/2001	12/12/2001	12/18/2001	12/18/2001	12/18/2001
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte:								
1,2,3,4,6,7,8,9-OCDD	0.0136	0.0014 J	0.0011 J	0.0037 J	0.312 J	0.00074 J	0.0035 J	0.0014 J
1,2,3,4,6,7,8,9-OCDF	0.0089	0.00031 J	0.00044 J	0.0016 J	0.174 J	0.00017 J	0.00098 J	0.00065 J
1,2,3,4,6,7,8-HxCDD	0.0012 J	0.00009 J	0.0001 J	0.00029 J	0.0277	0.00007 J	0.00031 J	0.00016 J
1,2,3,4,6,7,8-HxCDF	0.0013 J	0.00002 U	0.00009 J	0.00026 J	0.0226	0.00002 U	0.0002 J	0.00009 J
1,2,3,4,7,8,9-HxCDF	0.00002 U	0.00002 U	0.00002 U	0.00002 U	0.0011 J	0.00002 U	0.00002 U	0.00002 U
1,2,3,4,7,8-HxCDD	0.00002 U	0.00002 U	0.00002 U	0.00002 U	0.0001 J	0.00002 U	0.00002 U	0.00002 U
1,2,3,4,7,8-HxCDF	0.00001 UJ	0.00002 UJ	0.00001 UJ	0.00001 UJ	0.00048 J	0.00002 U	0.00001 U	0.00001 U
1,2,3,6,7,8-HxCDD	0.00002 U	0.00002 U	0.00002 U	0.00002 U	0.00099 J	0.00002 U	0.00002 U	0.00002 U
1,2,3,6,7,8-HxCDF	0.00001 UJ	0.00002 UJ	0.00002 UJ	0.00001 UJ	0.00012 J	0.00002 U	0.00002 U	0.00001 U
1,2,3,7,8,9-HxCDD	0.00006 J	0.00002 U	0.00002 U	0.00002 U	0.00029 J	0.00002 U	0.00002 U	0.00002 U
1,2,3,7,8,9-HxCDF	0.00002 UJ	0.00002 UJ	0.00002 UJ	0.00001 UJ	0.0001 J	0.00002 U	0.00002 U	0.00001 U
1,2,3,7,8-PeCDD	0.00002 U	0.00002 U	0.00002 U	0.00002 U	0.00002 U	0.00003 U	0.00003 U	0.00002 U
1,2,3,7,8-PeCDF	0.00002 U	0.00002 U	0.00002 U	0.00002 U	0.00038 J	0.00002 U	0.00002 U	0.00002 U
2,3,4,6,7,8-HxCDF	0.00002 UJ	0.00002 UJ	0.00002 UJ	0.00001 UJ	0.00031 J	0.00002 U	0.00002 U	0.00001 U
2,3,4,7,8-PeCDF	0.00002 U	0.00002 U	0.00002 U	0.00002 U	0.00009 J	0.00002 U	0.00002 U	0.00002 U
2,3,7,8-TCDD	0.00001 U	0.00001 U	0.00001 U	0.00001 U	0.00001 U	0.00002 U	0.00002 U	0.00001 U
2,3,7,8-TCDF	0.00001 U	0.00001 U	0.00001 U	0.00001 U	0.0002 J	0.00001 U	0.00001 U	0.00001 U
Total HpCDD	0.021 J	0.00021 J	0.00019 J	0.00059 J	0.0526	0.00015 J	0.00067 J	0.0003 J
Total HpCDF	0.004 J	0.0001 J	0.00027 J	0.00086 J	0.085	0.00008 J	0.00056 J	0.00033 J
Total HxCDD	0.00051 J	0.00002 U	0.00002 U	0.00002 U	0.0062	0.00002 U	0.00007 J	0.00002 U
Total HxCDF	0.00059 J	0.00002 U	0.00001 U	0.00008 J	0.0156 J	0.00002 U	0.0001 J	0.00003 J
Total PeCDD	0.0001 J	0.00002 U	0.00002 U	0.00002 U	0.0016 J	0.00003 U	0.00003 U	0.00002 U
Total PeCDF	0.00002 U	0.00002 U	0.00002 U	0.00002 U	0.0025 J	0.00002 U	0.00002 U	0.00002 U
Total TCDD	0.0026 UJ	0.0027 UJ	0.0029 UJ	0.0028 UJ	0.0105 J	0.0023 UJ	0.0025 UJ	0.0026 UJ
Total TCDF	0.00006 UJ	0.00007 UJ	0.00007 UJ	0.00007 UJ	0.0021 J	0.00007 UJ	0.00006 UJ	0.00007 UJ
2,3,7,8-TCDD-TEQ	0.00004435	0.000014271	0.000014654	0.00001713	0.0008856	0.000020491	0.000024648	0.0000202495

Notes:

J - Detected, estimated.

U - Nondetected.

UJ - Nondetected, detection limit is estimated.

R - Rejected.

(a) - Calculated in accordance with the steps outlined in Section 3.1.3 and 4.5 of the human health risk assessment.

Note that totals are not presented for duplicates; the total for the parent sample is the average total of the sample and the duplicate.

TABLE B-3
CALULATION OF TCDD-TEQ
SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
HUMAN HEALTH RISK ASSESSMENT

Creek segment Sample	E CBS-CSE-T3-1-FD 12/18/2001 mg/kg	E CBS-CSE-T4-1 12/18/2001 mg/kg	E CBS-CSE-T5-1 12/18/2001 mg/kg	E CBS-CSE-T6-1 12/18/2001 mg/kg	E CBS-CSE-T7-1 12/19/2001 mg/kg	E CBS-CSE-T8-1 12/19/2001 mg/kg	E CBS-CSE-T9-1 12/19/2001 mg/kg	E CBS-CSE-T10-1 12/19/2001 mg/kg
1,2,3,4,6,7,8,9-OCDD	0.0018 J	0.001 J	0.00051 J	0.0028 J	0.0052 J	0.0031 J	0.00032 U	0.00019 U
1,2,3,4,6,7,8,9-OCDF	0.00064 J	0.00011 J	0.00013 J	0.0014 J	0.0013 J	0.0013 J	0.00005 U	0.00008 U
1,2,3,4,6,7,8-HxCDD	0.00014 J	0.00006 J	0.00005 U	0.00026 J	0.00043 J	0.00023 J	0.00003 U	0.00006 U
1,2,3,4,6,7,8-HxCDF	0.00014 J	0.00003 U	0.00005 U	0.00019 J	0.00019 J	0.00016 J	0.00002 U	0.00004 U
1,2,3,4,7,8,9-HxCDF	0.00003 U	0.00003 U	0.00005 U	0.00006 U	0.00003 U	0.00002 U	0.00003 U	0.00004 U
1,2,3,4,7,8-HxCDD	0.00002 U	0.00003 U	0.00004 U	0.00007 U	0.00002 U	0.00002 U	0.00002 U	0.00004 U
1,2,3,4,7,8-HxCDF	0.00002 U	0.00002 U	0.00003 U	0.00004 U	0.00002 U	0.00001 U	0.00002 U	0.00002 U
1,2,3,6,7,8-HxCDD	0.00003 U	0.00004 U	0.00004 U	0.00001 J	0.00003 U	0.00002 U	0.00003 U	0.00004 U
1,2,3,6,7,8-HxCDF	0.00002 U	0.00003 U	0.00004 U	0.00004 U	0.00002 U	0.00002 U	0.00002 U	0.00003 U
1,2,3,7,8,9-HxCDD	0.00003 U	0.00003 U	0.00004 U	0.00007 U	0.00003 U	0.00002 U	0.00003 U	0.00005 U
1,2,3,7,8,9-HxCDF	0.00002 U	0.00003 U	0.00004 U	0.00005 U	0.00002 U	0.00002 U	0.00002 U	0.00003 U
1,2,3,7,8-PeCDD	0.00003 U	0.00004 U	0.00005 U	0.00001 U	0.00003 U	0.00003 U	0.00003 U	0.00005 U
1,2,3,7,8-PeCDF	0.00003 U	0.00003 U	0.00004 U	0.00007 U	0.00002 U	0.00002 U	0.00002 U	0.00004 U
2,3,4,6,7,8-HxCDF	0.00002 U	0.00003 U	0.00003 U	0.00005 U	0.00002 U	0.00002 U	0.00002 U	0.00003 U
2,3,4,7,8-PeCDF	0.00003 U	0.00003 U	0.00004 U	0.00007 U	0.00003 U	0.00003 U	0.00003 U	0.00004 U
2,3,7,8-TCDD	0.00002 U	0.00002 U	0.00003 U	0.00007 U	0.00002 U	0.00002 U	0.00002 U	0.00003 U
2,3,7,8-TCDF	0.00002 U	0.00002 U	0.00003 U	0.00006 U	0.00002 U	0.00002 U	0.00002 U	0.00002 U
Total HpCDD	0.00032 J	0.00014 J	0.00005 U	0.00048 J	0.00095 J	0.00048 J	0.00003 U	0.00006 U
Total HpCDF	0.00042 J	0.00003 U	0.00005 U	0.00072 J	0.00072 J	0.00067 J	0.00002 U	0.00004 U
Total HxCDD	0.00002 U	0.00003 U	0.00004 U	0.00006 J	0.00009 J	0.00002 U	0.00002 U	0.00004 U
Total HxCDF	0.00002 U	0.00002 U	0.00003 U	0.00011 J	0.00016 J	0.00014 J	0.00002 U	0.00002 U
Total PeCDD	0.00003 U	0.00004 U	0.00005 U	0.00001 U	0.00003 U	0.00003 U	0.00003 U	0.00005 U
Total PeCDF	0.00003 U	0.00003 U	0.00004 U	0.00007 U	0.00002 U	0.00002 U	0.00002 U	0.00004 U
Total TCDD	0.0025 UJ	0.0024 UJ	0.0023 UJ	0.0025 UJ	0.0025 UJ	0.0026 UJ	0.0027 UJ	0.0024 UJ
Total TCDF	0.00008 UJ	0.0001 UJ	0.00011 UJ	0.00006 UJ	0.00008 UJ	0.00008 UJ	0.00008 UJ	0.00008 UJ
2,3,7,8-TCDD-TEQ	0.000028011	0.000034814	0.000012	0.000028	0.000028	0.00002394	0.0000214185 U	0.0000337135 U

Notes:

J - Detected, estimated.

U - Nondetected.

UU - Nondetected, detection

limit is estimated.

R - Rejected.

(a) - Calculated in accordance with the steps outlined in Section 3.1.3 and 4.5 of the human health risk assessment.

Note that totals are not presented for duplicates; the total for the parent sample is the average total of the sample and the duplicate.

TABLE B-3
CALULATION OF TCDD-TEQ
SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
HUMAN HEALTH RISK ASSESSMENT

Creek segment Sample	E CBS-CSE-T11-1	E CBS-CSE-T12-1	E CBS-CSE-T13-2	E CBS-CSE-T14-1	E CBS-CSE-T15-1	E CBS-CSE-T15-1-FD	E CBS-CSE-T16-1	E CBS-CSE-T17-1
Sample date	12/19/2001	12/19/2001	2/14/2002	12/18/2001	12/18/2001	12/18/2001	12/21/2001	12/21/2001
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte:								
1,2,3,4,6,7,8,9-OCDD	0.0023 J	0.00026 U	0.0038 J	0.0026 J	0.00062 J	0.0006 J	0.037	0.0474
1,2,3,4,6,7,8,9-OCDF	0.00099 J	0.00006 U	0.0015 J	0.0011 J	0.00009 J	0.00012 J	0.0166	0.0149
1,2,3,4,6,7,8-HxCDD	0.00023 J	0.00004 U	0.0003 J	0.00024 J	0.00005 J	0.00004 J	0.0029 J	0.0045
1,2,3,4,6,7,8-HpCDF	0.00015 J	0.00003 U	0.00022 J	0.00019 J	0.00002 J	0.00003 J	0.0017 J	0.0021 J
1,2,3,4,7,8,9-HpCDF	0.00003 U	0.00003 U	0.000007 U	0.000007 U	0.000006 U	0.000005 U	0.0001 J	0.0001 J
1,2,3,4,7,8-HxCDD	0.00003 U	0.00003 U	0.000007 U	0.000007 U	0.000007 U	0.000006 U	0.00002 U	0.00001 U
1,2,3,4,7,8-HxCDF	0.00002 U	0.00002 U	0.000005 U	0.000005 U	0.000004 U	0.000004 U	0.00005 J	0.00005 J
1,2,3,6,7,8-HxCDD	0.00003 U	0.00003 U	0.00001 J	0.00001 J	0.000006 U	0.000006 U	0.00009 J	0.00012 J
1,2,3,6,7,8-HxCDF	0.00002 U	0.00002 U	0.000004 U	0.000005 U	0.000004 U	0.000003 U	0.00003 J	0.00004 J
1,2,3,7,8,9-HxCDD	0.00003 U	0.00003 U	0.000007 U	0.000008 U	0.000007 U	0.000006 U	0.00002 U	0.00011 J
1,2,3,7,8,9-HxCDF	0.00002 U	0.00002 U	0.000005 U	0.000005 U	0.000004 U	0.000004 U	0.00001 U	0.00001 U
1,2,3,7,8-PeCDD	0.00004 U	0.00003 U	0.00001 U	0.00001 U	0.00001 U	0.000008 U	0.00002 U	0.00004 J
1,2,3,7,8-PeCDF	0.00003 U	0.00003 U	0.000008 U	0.000008 U	0.000008 U	0.000007 U	0.00002 U	0.00001 U
2,3,4,6,7,8-HxCDF	0.00002 U	0.00002 U	0.000005 U	0.000005 U	0.000004 U	0.000004 U	0.00001 U	0.00001 U
2,3,4,7,8-PeCDF	0.00003 U	0.00003 U	0.000008 U	0.000008 U	0.000008 U	0.000007 U	0.00002 U	0.00001 U
2,3,7,8-TCDD	0.00002 U	0.00002 U	0.000008 U	0.000007 U	0.000007 U	0.000006 U	0.00002 U	0.00001 U
2,3,7,8-TCDF	0.00002 U	0.00002 U	0.000007 U	0.000007 U	0.000007 U	0.000006 U	0.00004 J	0.00005 J
Total HpCDD	0.00046 J	0.00004 U	0.00059 J	0.00046 J	0.0001 J	0.00009 J	0.0058	0.0086
Total HpCDF	0.00055 J	0.00003 U	0.00083 J	0.00061 J	0.00005 J	0.00007 J	0.0078	0.0083
Total HxCDD	0.00003 U	0.00003 U	0.00009 J	0.00005 J	0.000006 U	0.000006 U	0.0018 J	0.0012 J
Total HxCDF	0.00005 J	0.00002 U	0.00012 J	0.00009 J	0.000004 U	0.000009 J	0.00091 J	0.0022 J
Total PeCDD	0.00004 U	0.00003 U	0.00003 J	0.00001 U	0.00001 U	0.000008 U	0.0015 J	0.0007 J
Total PeCDF	0.00003 U	0.00003 U	0.000008 U	0.000008 U	0.000008 U	0.000007 U	0.00091 J	0.0013 J
Total TCDD	0.0026 UJ	0.0026 UJ	0.0025 UJ	0.0022 UJ	0.002 UJ	0.002 UJ	0.003 UJ	0.0027 UJ
Total TCDF	0.00007 UJ	0.00007 UJ	0.00006 UJ	0.00006 UJ	0.00005 UJ	0.00005 UJ	0.0013 J	0.0016 J
2,3,7,8-TCDD-TEQ	0.000030279	0.000021516 U	0.000012915	0.000011955	0.000006624		0.00008436	0.00010523

Notes:

J - Detected, estimated.

U - Nondetected.

UJ - Nondetected, detection

limit is estimated.

R - Rejected.

(a) - Calculated in accordance with the steps outlined in Section 3.1.3 and 4.5 of the human health risk assessment.

Note that totals are not

presented for duplicates; the total for the parent sample is the average total of the sample and the duplicate.

TABLE B-3
CALULATION OF TCDD-TEQ
SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
HUMAN HEALTH RISK ASSESSMENT

Creek segment Sample	F CBS-CSF-T1-1	F CBS-CSF-T2-1	F CBS-CSF-T3-1	F CBS-CSF-T4-1	F CBS-CSF-T5-1	F CBS-CSF-T6-1	F CBS-CSF-T6-1-FD	F CBS-CSF-T7-1
Sample date	12/21/2001	12/11/2001	12/11/2001	12/11/2001	1/8/2002	1/16/2002	1/16/2002	1/16/2002
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte:								
1,2,3,4,6,7,8,9-OCDD	0.0011 J	0.00058 J	0.0074	0.00084 J	0.0059 J	0.0017 J	0.0011 J	0.00066 J
1,2,3,4,6,7,8,9-OCDF	0.00038 U	0.00013 J	0.0025 J	0.00003 U	0.0031 J	0.00018 J	0.00023 J	0.00014 J
1,2,3,4,6,7,8-HxCDD	0.0001 J	0.00001 U	0.00061 J	0.00002 U	0.0015 J	0.00009 J	0.00006 J	0.00008 J
1,2,3,4,6,7,8-HxCDF	0.00005 J	0.00001 U	0.00037 J	0.00002 U	0.00084 J	0.00003 U	0.00003 U	0.00002 U
1,2,3,4,7,8,9-HxCDF	0.00001 U	0.00001 U	0.00001 U	0.00002 U	0.00027 J	0.00003 U	0.00003 U	0.00002 U
1,2,3,4,7,8-HxCDD	0.00001 U	0.00001 U	0.00001 U	0.00002 U	0.00018 J	0.00003 U	0.00003 U	0.00002 U
1,2,3,4,7,8-HxCDF	0.000009 U	0.00001 UJ	0.00001 UJ	0.00002 UJ	0.00064 J	0.00002 U	0.00002 U	0.00002 U
1,2,3,6,7,8-HxCDD	0.00001 U	0.00001 U	0.00001 U	0.00002 U	0.00041 J	0.00003 U	0.00003 U	0.00003 U
1,2,3,6,7,8-HxCDF	0.000008 U	0.00001 UJ	0.00001 UJ	0.00002 UJ	0.00026 U	0.00002 U	0.00002 U	0.00002 U
1,2,3,7,8,9-HxCDD	0.00001 U	0.00001 U	0.00001 U	0.00002 U	0.00055 J	0.00003 U	0.00003 U	0.00003 U
1,2,3,7,8,9-HxCDF	0.00001 U	0.00001 UJ	0.00001 UJ	0.00002 UJ	0.00038 J	0.00002 U	0.00002 U	0.00002 U
1,2,3,7,8-PeCDD	0.00002 U	0.00001 U	0.00001 U	0.00002 U	0.00025 J	0.00004 U	0.00003 U	0.00003 U
1,2,3,7,8-PeCDF	0.00002 U	0.00001 U	0.00001 U	0.00002 U	0.0003 J	0.00003 U	0.00003 U	0.00003 U
2,3,4,6,7,8-HxCDF	0.00001 U	0.00001 UJ	0.00001 UJ	0.00002 UJ	0.00026 J	0.00002 U	0.00002 U	0.00002 U
2,3,4,7,8-PeCDF	0.00002 U	0.00001 U	0.00001 U	0.00002 U	0.00035 J	0.00003 U	0.00003 U	0.00003 U
2,3,7,8-TCDD	0.00001 U	0.000009 U	0.000008 U	0.00001 U	0.00006 U	0.00002 U	0.00002 U	0.00002 U
2,3,7,8-TCDF	0.00001 U	0.000007 U	0.000007 U	0.00001 U	0.00075 J	0.00002 U	0.00002 U	0.00002 U
Total HpCDD	0.00021 J	0.00001 U	0.0012 J	0.00002 U	0.0028 J	0.00017 J	0.00006 J	0.00008 J
Total HpCDF	0.0002 J	0.00005 J	0.0014 J	0.00002 U	0.0024 J	0.00003 U	0.00005 J	0.00007 J
Total HxCDD	0.00002 J	0.00001 U	0.00007 J	0.00002 U	0.0042 J	0.00003 U	0.00003 U	0.00002 U
Total HxCDF	0.00004 J	0.00001 U	0.00029 J	0.00002 U	0.007 J	0.00002 U	0.00002 U	0.00002 U
Total PeCDD	0.00002 U	0.00001 U	0.00001 U	0.00002 U	0.0036 J	0.00004 U	0.00003 U	0.00003 U
Total PeCDF	0.00002 U	0.00001 U	0.00008 J	0.00002 U	0.0029 J	0.00003 U	0.00003 U	0.00003 U
Total TCDD	0.0022 UJ	0.0027 UJ	0.0028 UJ	0.0026 UJ	0.0307 J	0.0026 UJ	0.0028 UJ	0.0024 UJ
Total TCDF	0.00007 UJ	0.00006 UJ	0.00023 J	0.00007 UJ	0.0042 J	0.00007 UJ	0.00007 UJ	0.00007 UJ
2,3,7,8-TCDD-TEQ	0.000020629	0.000011321	0.00002194	0.0000223855	0.000769	0.0000354605		0.00003233

Notes:

J - Detected, estimated.

U - Nondetected.

UJ - Nondetected, detection limit is estimated.

R - Rejected.

(a) - Calculated in accordance with the steps outlined in Section 3.1.3 and 4.5 of the human health risk assessment.

Note that totals are not

presented for duplicates; the total for the parent sample is the average total of the sample and the duplicate.

TABLE B-3
CALULATION OF TCDD-TEQ
SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
HUMAN HEALTH RISK ASSESSMENT

Creek segment Sample	F CBS-CSF-T8-1	F CBS-CSF-T9-1	F CBS-CSF-T9-1-FD	F CBS-CSF-T10-1	F CBS-CSF-T11-1	F CBS-CSF-T12-1	F CBS-CSF-T13-1	F CBS-CSF-T14-1	
Sample date	1/23/2002	1/23/2002	1/23/2002	1/25/2002	1/25/2002	1/23/2002	1/16/2002	1/8/2002	
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
Analyte:									
1,2,3,4,6,7,8,9-OCDD	0.00031 J	0.00069 J	0.00083 J	0.00037 J	0.0011 J	0.00087 J	0.00014 J	0.0092	
1,2,3,4,6,7,8,9-OCDF	0.00009 UJ	0.00028 J	0.00031 U	0.0001 J	0.00015 J	0.00019 U	0.00004 U	0.0076	
1,2,3,4,6,7,8-HxCDD	0.00005 U	0.00007 J	0.00008 J	0.00006 J	0.00008 J	0.00011 J	0.00003 U	0.0011 J	
1,2,3,4,6,7,8-HpCDF	0.00004 U	0.00004 J	0.00005 J	0.00002 U	0.00003 U	0.00006 J	0.00002 U	0.00093 J	
1,2,3,4,7,8,9-HpCDF	0.00004 U	0.00008 U	0.00009 U	0.00002 U	0.00003 U	0.00004 U	0.00002 U	0.0001 J	
1,2,3,4,7,8-HxCDD	0.00004 U	0.00001 U	0.00001 U	0.00002 U	0.00003 U	0.00004 U	0.00002 U	0.00005 J	
1,2,3,4,7,8-HxCDF	0.00003 U	0.00006 U	0.00006 U	0.00001 U	0.00002 U	0.00002 U	0.00002 U	0.00017 UJ	
1,2,3,6,7,8-HxCDD	0.00005 U	0.00001 U	0.00001 U	0.00002 U	0.00003 U	0.00004 U	0.00002 U	0.00014 J	
1,2,3,6,7,8-HxCDF	0.00003 U	0.00006 U	0.00006 U	0.00001 U	0.00002 U	0.00002 U	0.00002 U	0.00008 UJ	
1,2,3,7,8,9-HxCDD	0.00005 U	0.00001 U	0.00001 U	0.00002 U	0.00003 U	0.00004 U	0.00002 U	0.00014 J	
1,2,3,7,8,9-HxCDF	0.00003 U	0.00006 U	0.00006 U	0.00002 U	0.00002 U	0.00003 U	0.00002 U	0.00002 UJ	
1,2,3,7,8-PeCDD	0.00005 U	0.00001 U	0.00001 U	0.00003 U	0.00004 U	0.00005 U	0.00003 U	0.00008 J	
1,2,3,7,8-PeCDF	0.00004 U	0.00001 U	0.00001 U	0.00002 U	0.00003 U	0.00004 U	0.00002 U	0.00008 J	
2,3,4,6,7,8-HxCDF	0.00003 U	0.00006 U	0.00006 U	0.00002 U	0.00002 U	0.00003 U	0.00002 U	0.00002 UJ	
2,3,4,7,8-PeCDF	0.00004 U	0.00001 U	0.00001 U	0.00002 U	0.00003 U	0.00004 U	0.00002 U	0.00002 UJ	
2,3,7,8-TCDD	0.00003 U	0.00001 U	0.00001 U	0.00002 U	0.00002 U	0.00003 U	0.00002 U	0.00001 U	
2,3,7,8-TCDF	0.00003 U	0.00001 U	0.00009 U	0.00001 U	0.00002 U	0.00003 U	0.00002 U	0.00017 J	
Total HpCDD	0.00005 U	0.00015 J	0.00018 J	0.00013 J	0.00016 J	0.00011 J	0.00003 U	0.002 J	
Total HpCDF	0.00004 U	0.00014 J	0.00018 J	0.00005 J	0.00007 J	0.00014 J	0.00002 U	0.0036	
Total HxCDD	0.00004 U	0.00001 U	0.00001 U	0.00002 U	0.00003 U	0.00004 U	0.00002 U	0.0011 J	
Total HxCDF	0.00003 U	0.00001 J	0.00002 J	0.00001 U	0.00002 U	0.00002 U	0.00002 U	0.0017 J	
Total PeCDD	0.00005 U	0.00001 U	0.00001 U	0.00003 U	0.00004 U	0.00005 U	0.00003 U	0.00083 J	
Total PeCDF	0.00004 U	0.00001 U	0.00001 U	0.00002 U	0.00003 U	0.00004 U	0.00002 U	0.00061 J	
Total TCDD	0.0025 UJ	0.0022 UJ	0.0022 UJ	0.0025 UJ	0.0027 UJ	0.0024 UJ	0.0022 UJ	0.0027 UJ	
Total TCDF	0.00009 UJ	0.00006 UJ	0.00006 UJ	0.00007 UJ	0.00008 UJ	0.00008 UJ	0.00007 UJ	0.0011 J	
2,3,7,8-TCDD-TEQ	0.0000496855	0.00001196525		0.000027347	0.000037975		0.0000494965	0.000027866	0.00021748

Notes:

J - Detected, estimated.

U - Nondetected.

UJ - Nondetected, detection

limit is estimated.

R - Rejected.

(a) - Calculated in accordance with the steps outlined in Section 3.1.3 and 4.5 of the human health risk assessment.

Note that totals are not

presented for duplicates; the total for the parent sample is the average total of the sample and the duplicate.

TABLE B-3
CALULATION OF TCDD-TEQ
SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
HUMAN HEALTH RISK ASSESSMENT

Creek segment Sample	F CBS-CSF-T15-1	F CBS-CSF-T15-1-FD	F CBS-CSF-T16-1	SITE M SED-M-S2 0-6	SITE M SED-M-S3-(0-6)	SITE M SED-M-S4-(0-6)	SITE M SED-M-S5 0-6	SITE M SED-M-S6-(0-6)
Sample date	1/8/2002	1/8/2002	2/6/2002	6/22/2001	7/10/2001	8/1/2001	6/22/2001	7/10/2001
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte:								
1,2,3,4,6,7,8,9-OCDD	0.008	0.0067	0.0022 J	0.0347	0.135	0.339 J	0.11	0.0407 J
1,2,3,4,6,7,8,9-OCDF	0.0046 J	0.0043 J	0.00007 U	0.0134	0.032	0.153 J	0.0533	0.005 J
1,2,3,4,6,7,8-HxCDD	0.00063 J	0.00065 J	0.00005 U	0.0043	0.0102	0.0278	0.0142	0.004 J
1,2,3,4,6,7,8-HpCDF	0.00061 J	0.00068 J	0.00004 U	0.0023 J	0.0038	0.0153	0.0116	0.00085 J
1,2,3,4,7,8,9-HpCDF	0.00002 UJ	0.00003 UJ	0.00004 U	0.00011 J	0.00004 U	0.00088 J	0.00054 J	0.00005 U
1,2,3,4,7,8-HxCDD	0.00002 U	0.00002 U	0.00004 U	0.00002 U	0.00003 U	0.00004 U	0.00003 U	0.00004 U
1,2,3,4,7,8-HxCDF	0.00005 U	0.00008 U	0.00002 U	0.000009 U	0.00013 J	0.00003 U	0.00038 J	0.00003 U
1,2,3,6,7,8-HxCDD	0.00005 J	0.00004 J	0.00004 U	0.00014 J	0.00028 J	0.00091 J	0.00059 J	0.00015 J
1,2,3,6,7,8-HxCDF	0.00002 U	0.00002 U	0.00002 U	0.000009 U	0.00002 U	0.00003 U	0.00015 J	0.00003 U
1,2,3,7,8,9-HxCDD	0.00006 J	0.00006 J	0.00004 U	0.00009 J	0.00003 U	0.00029 J	0.00023 J	0.00004 U
1,2,3,7,8,9-HxCDF	0.00002 UJ	0.00002 UJ	0.00003 U	0.00001 U	0.00003 U	0.00004 U	0.00002 U	0.00003 U
1,2,3,7,8-PeCDD	0.00002 U	0.00002 U	0.00004 U	0.00002 U	0.00004 U	0.00006 U	0.00003 U	0.00006 U
1,2,3,7,8-PeCDF	0.00002 U	0.00002 U	0.00003 U	0.00001 U	0.00001 U	0.00002 U	0.00001 U	0.00002 U
2,3,4,6,7,8-HxCDF	0.00002 UJ	0.00002 UJ	0.00003 U	0.00001 U	0.00003 U	0.00014 J	0.00014 J	0.00003 U
2,3,4,7,8-PeCDF	0.00002 U	0.00002 U	0.00003 U	0.00001 U	0.00002 U	0.00003 U	0.00006 J	0.00003 U
2,3,7,8-TCDD	0.00001 U	0.00001 U	0.00002 U	0.00001 U	0.00002 U	0.00003 U	0.00002 U	0.00003 U
2,3,7,8-TCDF	0.00005 J	0.00004 J	0.00002 U	0.00001 U	0.00001 U	0.00002 U	0.00008 J	0.00002 U
Total HpCDD	0.0012 J	0.0012 J	0.00005 U	0.0079	0.0283	0.0538	0.027	0.0069
Total HpCDF	0.0017 J	0.0023 J	0.00004 U	0.0091	0.0149	0.0683 J	0.0421	0.0034
Total HxCDD	0.00039 J	0.00035 J	0.00004 U	0.0013 J	0.0082 J	0.0078 J	0.0161 J	0.0013 J
Total HxCDF	0.00041 UJ	0.00056 UJ	0.00002 U	0.0013 J	0.0019 J	0.009 J	0.0117 J	0.00075 J
Total PeCDD	0.00004 J	0.00004 J	0.00004 U	0.00052 J	0.0024 J	0.0022 J	0.0137 J	0.00014 J
Total PeCDF	0.00008 J	0.00002 U	0.00003 U	0.00013 J	0.00007 J	0.00049 J	0.0023 J	0.00007 J
Total TCDD	0.0026 UJ	0.0024 UJ	0.0024 UJ	0.0035 UJ	0.0034 UJ	0.0051 UJ	0.0038 UJ	0.0033 UJ
Total TCDF	0.00022 UJ	0.0001 UJ	0.00005 UJ	0.00016 UJ	0.00003 J	0.00002 U	0.0025 J	0.00002 U
2,3,7,8-TCDD-TEQ	0.000050905		0.0000401235	0.00009956	0.00020765	0.0006225	0.00046698	0.00008382

Notes:

J - Detected, estimated.

U - Nondetected.

UJ - Nondetected, detection

limit is estimated.

R - Rejected.

(a) - Calculated in accordance with the steps outlined in Section 3.1.3 and 4.5 of the human health risk assessment.

Note that totals are not

presented for duplicates; the total for the parent sample is the average total of the sample and the duplicate.

TABLE B-3
CALULATION OF TCDD-TEQ
SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
HUMAN HEALTH RISK ASSESSMENT

Creek segment Sample	SITE M SED-M-S7-(0-6)	SITE M SED-M-S7-FD(0-6)	SITE M SED-M-S8 0-6	SITE M SED-M-S9-(0-6)	SITE M SED-M-S10 0-6
Sample date	8/1/2001	8/1/2001	6/22/2001	7/10/2001	6/22/2001
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Analyte:					
1,2,3,4,6,7,8,9-OCDD	0.44 J	0.455 J	0.172	0.142	1.36
1,2,3,4,6,7,8,9-OCDF	0.12	0.129 J	0.139	0.0677	0.88
1,2,3,4,6,7,8-HxCDD	0.0399	0.0413	0.0243	0.0211	0.25
1,2,3,4,6,7,8-HxCDF	0.0141	0.0148	0.017	0.0085	0.0886
1,2,3,4,7,8,9-HxCDF	0.0012 J	0.0011 J	0.0011 J	0.00055 J	0.0072
1,2,3,4,7,8-HxCDD	0.00009 U	0.00009 U	0.00004 U	0.00003 U	0.0002 U
1,2,3,4,7,8-HxCDF	0.00006 U	0.00006 U	0.00047 J	0.00022 J	0.0043
1,2,3,6,7,8-HxCDD	0.0014 J	0.0014 J	0.00094 J	0.00056 J	0.0059
1,2,3,6,7,8-HxCDF	0.00006 U	0.00006 U	0.00002 U	0.00002 U	0.00079 J
1,2,3,7,8,9-HxCDD	0.00089 J	0.00081 J	0.00004 U	0.00013 J	0.00084 J
1,2,3,7,8,9-HxCDF	0.00007 U	0.00007 U	0.00003 U	0.00003 U	0.0002 U
1,2,3,7,8-PeCDD	0.0001 U	0.0001 U	0.00003 U	0.00004 U	0.0002 U
1,2,3,7,8-PeCDF	0.00004 U	0.00004 U	0.00001 U	0.00002 U	0.00062 J
2,3,4,6,7,8-HxCDF	0.00006 U	0.00006 U	0.00019 J	0.00003 U	0.00059 J
2,3,4,7,8-PeCDF	0.00005 U	0.00005 U	0.00002 U	0.00002 U	0.00036 J
2,3,7,8-TCDD	0.00006 U	0.00006 U	0.00002 U	0.00002 U	0.00008 U
2,3,7,8-TCDF	0.00004 U	0.00004 U	0.00009 J	0.00002 U	0.0009 J
Total HpCDD	0.0728	0.0783	0.0434	0.0422	0.447
Total HpCDF	0.0663 J	0.0695	0.0736	0.042	0.59
Total HxCDD	0.0101 J	0.0111 J	0.0157 J	0.0075	0.0439 J
Total HxCDF	0.0111	0.0104 J	0.0132	0.0059 J	0.0653 J
Total PeCDD	0.0019 J	0.0014 J	0.0087 J	0.0014 J	0.0348 J
Total PeCDF	0.00038 J	0.00038 J	0.0014 J	0.00036 J	0.0072 J
Total TCDD	0.0077 UJ	0.008 UJ	0.0038 UJ	0.0074 UJ	0.0862 J
Total TCDF	0.0023	0.0032 J	0.0021 J	0.00029 J	0.0087 J
2,3,7,8-TCDD-TEQ	0.0008615	0.0008759	0.00063235	0.00042247	0.005225

Notes:

J - Detected, estimated.

U - Nondetected.

UJ - Nondetected, detection

limit is estimated.

R - Rejected.

(a) - Calculated in accordance with the steps outlined in Section 3.1.3 and 4.5 of the human health risk assessment.

Note that totals are not presented for duplicates; the total for the parent sample is the average total of the sample and the duplicate.

Attachment C

Background Calculations

APPENDIX C

SUMMARY STATISTICS AND CALCULATION OF BACKGROUND CONCENTRATIONS - CREEK BOTTOM SOILS
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Constituent	Units	Frequency of Detection			Summary Statistics			Calculated Background Concentration (a)
		Total # Samples (b)	# Detects	% Detected	Minimum	Average	Maximum	
2,4-D	ug/kg	4	1	25%	8.50E+00	1.01E+01	1.20E+01	2.03E+01
2-Butanone (MEK)	ug/kg	4	3	75%	1.40E+01	2.49E+01	4.00E+01	4.99E+01
Acetone	ug/kg	4	3	75%	4.75E+01	7.78E+01	1.60E+02	1.56E+02
Aluminum	mg/kg	4	4	100%	1.20E+04	1.45E+04	1.90E+04	2.90E+04
Antimony	mg/kg	3	2	67%	1.30E+00	1.38E+00	1.45E+00	2.75E+00
Arsenic	mg/kg	4	4	100%	6.70E+00	7.18E+00	8.00E+00	1.44E+01
Barium	mg/kg	4	4	100%	1.65E+02	2.06E+02	2.30E+02	4.13E+02
Beryllium	mg/kg	4	4	100%	6.20E-01	7.80E-01	1.00E+00	1.56E+00
Cadmium	mg/kg	4	4	100%	2.90E-01	4.15E-01	6.50E-01	8.30E-01
Calcium	mg/kg	4	4	100%	1.20E+04	1.35E+04	1.80E+04	2.70E+04
Chromium	mg/kg	4	4	100%	1.70E+01	2.00E+01	2.50E+01	4.00E+01
Cobalt	mg/kg	4	4	100%	7.10E+00	8.60E+00	1.00E+01	1.72E+01
Copper	mg/kg	4	4	100%	1.60E+01	1.90E+01	2.30E+01	3.80E+01
Iron	mg/kg	4	4	100%	1.75E+04	2.06E+04	2.40E+04	4.13E+04
Lead	mg/kg	4	4	100%	1.65E+01	2.19E+01	2.60E+01	4.38E+01
Magnesium	mg/kg	4	4	100%	3.25E+03	5.14E+03	6.50E+03	1.03E+04
Manganese	mg/kg	4	4	100%	5.70E+02	7.08E+02	7.70E+02	1.42E+03
Mercury	mg/kg	4	4	100%	4.00E-02	4.80E-02	6.30E-02	9.60E-02
Molybdenum	mg/kg	4	4	100%	3.70E-01	4.45E-01	5.30E-01	8.90E-01
Nickel	mg/kg	4	4	100%	1.75E+01	2.14E+01	2.60E+01	4.28E+01
Pentachlorophenol	ug/kg	4	1	25%	3.76E+02	3.76E+02	3.76E+02	7.52E+02
Potassium	mg/kg	4	4	100%	1.60E+03	2.10E+03	2.60E+03	4.20E+03
Total 2,3,7,8-TCDD-TEQ	ug/kg	4	4	100%	5.38E-03	6.22E-03	7.60E-03	1.24E-02
Total Organic Carbon	mg/kg	4	4	100%	1.20E+04	1.70E+04	2.30E+04	3.40E+04
Vanadium	mg/kg	4	4	100%	2.95E+01	3.49E+01	4.40E+01	6.98E+01
Zinc	mg/kg	4	4	100%	5.90E+01	8.30E+01	9.60E+01	1.66E+02

Notes:

(a) - Background as defined in the Human Health Risk Assessment Workplan for Sauget Area 1 is two times the average concentration in the background or reference samples (USEPA, Region 4, 2000.)

(b) - Samples SED-RA1-S1-0.2FT, SED-RA1-S2-0.2FT, SED-RA2-S1-0.2FT and SED-RA2-S2-0.2FT.

Attachment D

Screening Values

TABLE D-1

RESIDENTIAL SOIL DIRECT-CONTACT SCREENING VALUES
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

CAS Number	Constituent	Exposure Route-Specific Values for Soils (a)			
		Units	Ingestion	Inhalation	Selected (Lowest) Value
83-32-9	Acenaphthene	mg/kg	4700	ND	4700
67-64-1	Acetone	mg/kg	7800	100000	7800
15972-60-8	Alachlor	mg/kg	8	ND	8
116-06-3	Aldicarb	mg/kg	78	ND	78
309-00-2	Aldrin	mg/kg	0.04	3	0.04
120-12-7	Anthracene	mg/kg	23000	ND	23000
1912-24-9	Atrazine	mg/kg	2700	ND	2700
71-43-2	Benzene	mg/kg	22	0.8	0.8
56-55-3	Benzo(a)anthracene	mg/kg	0.9	ND	0.9
205-99-2	Benzo(b)fluoranthene	mg/kg	0.9	ND	0.9
207-08-9	Benzo(k)fluoranthene	mg/kg	9	ND	9
50-32-8	Benzo(a)pyrene	mg/kg	0.09	ND	0.09
111-44-4	Bis(2-chloroethyl)ether	mg/kg	0.6	0.2	0.2
117-81-7	Bis(2-ethylhexyl)phthalate	mg/kg	46	31000	46
75-27-4	Bromodichloromethane	mg/kg	10	3000	10
75-25-2	Bromoform	mg/kg	81	53	53
71-36-3	Butanol	mg/kg	7800	10000	7800
85-68-7	Butyl benzyl phthalate	mg/kg	16000	930	930
86-74-8	Carbazole	mg/kg	32	ND	32
1563-66-2	Carbofuran	mg/kg	390	ND	390
75-15-0	Carbon disulfide	mg/kg	7800	720	720
56-23-5	Carbon tetrachloride	mg/kg	5	0.3	0.3
57-74-9	Chlordane	mg/kg	0.5	20	0.5
106-47-8	4-Chloroaniline (p-Chloroaniline)	mg/kg	310	ND	310
108-90-7	Chlorobenzene (Monochlorobenzene)	mg/kg	1600	130	130
124-48-1	Chlorodibromomethane	mg/kg	1600	1300	1300
67-66-3	Chloroform	mg/kg	100	0.3	0.3
218-01-9	Chrysene	mg/kg	88	ND	88
94-75-7	24-D	mg/kg	780	ND	780
75-99-0	Dalapon	mg/kg	2300	ND	2300
72-54-8	DDD	mg/kg	3	ND	3
72-55-9	DDE	mg/kg	2	ND	2
50-29-3	DDT	mg/kg	2	ND	2
53-70-3	Dibenzo(ah)anthracene	mg/kg	0.09	ND	0.09
96-12-8	12-Dibromo-3 chloropropane	mg/kg	0.46	11	0.46
106-93-4	12-Dibromoethane (Ethylene dibromide)	mg/kg	0.0075	0.17	0.0075
84-74-2	Di-n-butyl phthalate	mg/kg	7800	2300	2300
95-50-1	12-Dichlorobenzene (o - Dichlorobenzene)	mg/kg	7000	560	560
106-46-7	14-Dichlorobenzene (p - Dichlorobenzene)	mg/kg	ND	ND	NA
91-94-1	33'-Dichlorobenzidine	mg/kg	1	ND	1
75-34-3	11-Dichloroethane	mg/kg	7800	1300	1300
107-06-2	12-Dichloroethane (Ethylene dichloride)	mg/kg	7	0.4	0.4
75-35-4	11-Dichloroethylene	mg/kg	700	1500	700
156-59-2	cis-12-Dichloroethylene	mg/kg	780	1200	780
156-60-5	trans-12 Dichloroethylene	mg/kg	1600	3100	1600
78-87-5	12-Dichloropropane	mg/kg	9	15	9
542-75-6	13-Dichloropropene	mg/kg	4	0.1	0.1
60-57-1	Dieldrin	mg/kg	0.04	1	0.04
84-66-2	Diethyl phthalate	mg/kg	63000	2000	2000
105-67-9	24-Dimethylphenol	mg/kg	1600	ND	1600
121-14-2	24-Dinitrotoluene	mg/kg	0.9	ND	0.9
606-20-2	26-Dinitrotoluene	mg/kg	0.9	ND	0.9
117-84-0	Di-n-octyl phthalate	mg/kg	1600	10000	1600
115-29-7	Endosulfan	mg/kg	470	ND	470
145-73-3	Endothall	mg/kg	1600	ND	1600
72-20-8	Endrin	mg/kg	23	ND	23

TABLE D-1
RESIDENTIAL SOIL DIRECT-CONTACT SCREENING VALUES
SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
HUMAN HEALTH RISK ASSESSMENT

CAS Number	Constituent	Exposure Route-Specific Values for Soils (a)			
		Units	Ingestion	Inhalation	Selected (Lowest) Value
100-41-4	Ethylbenzene	mg/kg	7800	400	400
206-44-0	Fluoranthene	mg/kg	3100	ND	3100
86-73-7	Fluorene	mg/kg	3100	ND	3100
76-44-8	Heptachlor	mg/kg	0.1	0.1	0.1
1024-57-3	Heptachlor epoxide	mg/kg	0.07	5	0.07
118-74-1	Hexachlorobenzene	mg/kg	0.4	1	0.4
319-84-6	alpha-HCH (alpha-BHC)	mg/kg	0.1	0.8	0.1
58-89-9	gamma-HCH (Lindane)	mg/kg	0.5	ND	0.5
77-47-4	Hexachlorocyclopentadiene	mg/kg	550	10	10
67-72-1	Hexachloroethane	mg/kg	78	ND	78
193-39-5	Indeno(123-cd)pyrene	mg/kg	0.9	ND	0.9
78-59-1	Isophorone	mg/kg	15600	4600	4600
72-43-5	Methoxychlor	mg/kg	390	ND	390
74-83-9	Methyl bromide (Bromomethane)	mg/kg	110	10	10
75-09-2	Methylene chloride (Dichloromethane)	mg/kg	85	13	13
95-48-7	2-Methylphenol (o - Cresol)	mg/kg	3900	ND	3900
91-20-3	Naphthalene	mg/kg	3100	ND	3100
98-95-3	Nitrobenzene	mg/kg	39	92	39
86-30-6	N-Nitrosodiphenylamine	mg/kg	130	ND	130
621-64-7	N-Nitrosodi-n propylamine	mg/kg	0.09	ND	0.09
108-95-2	Phenol	mg/kg	47000	ND	47000
1918-02-1	Picloram	mg/kg	5500	ND	5500
1336-36-3	Polychlorinated biphenyls (PCBs)	mg/kg	1	ND	1
129-00-0	Pyrene	mg/kg	2300	ND	2300
122-34-9	Simazine	mg/kg	390	ND	390
100-42-5	Styrene	mg/kg	16000	1500	1500
127-18-4	Tetrachloroethylene (Perchloroethylene)	mg/kg	12	11	11
108-88-3	Toluene	mg/kg	16000	650	650
8001-35-2	Toxaphene	mg/kg	0.6	89	0.6
120-82-1	124-Trichlorobenzene	mg/kg	780	3200	780
71-55-6	111-Trichloroethane	mg/kg	ND	1200	1200
79-00-5	112-Trichloroethane	mg/kg	310	1800	310
79-01-6	Trichloroethylene	mg/kg	58	5	5
108-05-4	Vinyl acetate	mg/kg	78000	1000	1000
75-01-4	Vinyl chloride	mg/kg	0.3	0.03	0.03
108-38-3	m-Xylene	mg/kg	160000	420	420
95-47-6	o-Xylene	mg/kg	160000	410	410
106-42-3	p-Xylene	mg/kg	160000	460	460
1330-20-7	Xylenes (total)	mg/kg	160000	410	410
	<u>Ionizable Organics</u>	mg/kg			0
65-85-0	Benzoic Acid	mg/kg	310000	ND	310000
95-57-8	2-Chlorophenol	mg/kg	390	53000	390
120-83-2	24-Dichlorophenol	mg/kg	230	ND	230
51-28-5	24-Dinitrophenol	mg/kg	160	ND	160
88-85-7	Dinoseb	mg/kg	78	ND	78
87-86-5	Pentachlorophenol	mg/kg	3	ND	3
93-72-1	245-TP (Silvex)	mg/kg	630	ND	630
95-95-4	245-Trichlorophenol	mg/kg	7800	ND	7800
88-06-2	246 Trichlorophenol	mg/kg	58	200	58

TABLE D-1

RESIDENTIAL SOIL DIRECT-CONTACT SCREENING VALUES
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

CAS Number	Constituent	Exposure Route-Specific Values for Soils (a)			
		Units	Ingestion	Inhalation	Selected (Lowest) Value
Inorganics					
7440-36-0	Antimony	mg/kg	31	ND	31
7440-38-2	Arsenic	mg/kg	0.4	750	0.4
7440-39-3	Barium	mg/kg	5500	690000	5500
7440-41-7	Beryllium	mg/kg	156 (n)	1340 (n)	156 (n)
7440-42-8	Boron	mg/kg	7000	ND	7000
7440-43-9	Cadmium	mg/kg	78	1800	78
16887-00-6	Chloride	mg/kg	ND	ND	NA
7440-47-3	Chromium total	mg/kg	390	270	270
16065-83-1	Chromium ion trivalent	mg/kg	78000	ND	78000
18540-29-9	Chromium (+6)	mg/kg	390	270	270
7440-48-4	Cobalt	mg/kg	4700	ND	4700
7440-50-8	Copper	mg/kg	2900	ND	2900
57-12-5	Cyanide	mg/kg	1600	ND	1600
7782-41-4	Fluoride	mg/kg	4700	ND	4700
15438-31-0	Iron	mg/kg	ND	ND	NA
7439-92-1	Lead	mg/kg	400	ND	400
7439-96-5	Manganese	mg/kg	3700	69000	3700
7439-97-6	Mercury	mg/kg	23	10	10
7440-02-0	Nickel	mg/kg	1600	13000	1600
14797-55-8	Nitrate as Np	mg/kg	130000	ND	130000
7782-49-2	Selenium	mg/kg	390	ND	390
7440-22-4	Silver	mg/kg	390	ND	390
14808-79-8	Sulfate	mg/kg	ND	ND	NA
7440-28-0	Thallium	mg/kg	6.3	ND	6.3
7440-62-2	Vanadium	mg/kg	550	ND	550
7440-66-6	Zinc	mg/kg	23000	ND	23000
Constituents Lacking TACO Standards					
93-76-5	2,4,5-T	mg/kg	--	--	610 (j)
94-82-6	2,4-DB	mg/kg	--	--	490 (j)
78-93-3	2-Butanone (MEK)	mg/kg	--	--	7300 (j)
591-78-6	2-Hexanone	mg/kg	--	--	790 (k)
91-57-6	2-Methylnaphthalene	mg/kg	--	--	3100 (h)
88-74-4	2-Nitroaniline	mg/kg	--	--	3.5 (j)
208-96-8	Acenaphthylene	mg/kg	--	--	4700 (b)
5103-71-9	Alpha Chlordane	mg/kg	--	--	0.5 (e)
7429-90-5	Aluminum	mg/kg	--	--	76000 (j)
191-24-2	Benzo(g,h,i)perylene	mg/kg	--	--	2300 (i)
319-85-7	beta-BHC	mg/kg	--	--	0.1 (c)
319-86-8	delta-BHC	mg/kg	--	--	0.1 (c)
541-73-1	1,3-Dichlorobenzene	mg/kg	--	--	13 (p)
106-46-7	1,4-Dichlorobenzene	mg/kg	--	--	3.4 (p)
132-64-9	Dibenzofuran	mg/kg	--	--	290 (j)
1918-00-9	Dicamba	mg/kg	--	--	NA (j)
120-36-5	Dichloroprop	mg/kg	--	--	NA (l)
1746-01-6	Dioxin	mg/kg	--	--	0.001 (m)
959-98-8	Endosulfan I	mg/kg	--	--	470 (f)
33213-65-9	Endosulfan II	mg/kg	--	--	470 (f)
1031-07-8	Endosulfan sulfate	mg/kg	--	--	470 (f)
7421-93-4	Endrin aldehyde	mg/kg	--	--	23 (g)

TABLE D-1

RESIDENTIAL SOIL DIRECT-CONTACT SCREENING VALUES
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

CAS Number	Constituent	Exposure Route-Specific Values for Soils (a)				
		Units	Ingestion	Inhalation	Selected (Lowest) Value	
53494-70-5	Endrin ketone	mg/kg	--	--	23	(g)
5103-74-2	Gamma Chlordane	mg/kg	--	--	0.5	(e)
87-68-3	Hexachlorobutadiene	mg/kg	--	--	6.2	(p)
94-74-6	MCPA	mg/kg	--	--	31	(j)
7085-19-0	MCPP	mg/kg	--	--	61	(j)
106-44-5	3&4-methylphenol	mg/kg	--	--	310	(p)
108-10-1	MIBK	mg/kg	--	--	790	(p)
7439-98-7	Molybdenum	mg/kg	--	--	390	(j)
100-01-6	4-Nitroaniline	mg/kg	--	--	3.5	(p)
100-02-7	4-Nitrophenol	mg/kg	--	--	490	(p)
85-01-8	Phenanthrene	mg/kg	--	--	23000	(d)
79-34-5	1,1,2,2-Tetrachloroethane	mg/kg	--	--	0.38	(p)
7440-31-5	Tin	mg/kg	--	--	47000	(p)

Notes:

CAS - Chemical Abstracts Service.

NA - Not Available.

ND - Not Determined.

TACO - Illinois Tiered Approach to Corrective Action.

(a) - Title 35, Subtitle G, Chapter I, Part 742 Illinois Tiered Approach to Corrective Action Objectives (TACO) Tier 1 values from Appendix B, Table A.

(b) - No TACO value available. Therefore, the TACO value for acenaphthene has been used due to structural similarity.

(c) - No TACO value available. Therefore, the TACO value for alpha-HCH has been used due to structural similarity.

(d) - No TACO value available. Therefore, the TACO value for anthracene has been used due to structural similarity.

(e) - No TACO value available. Therefore, the TACO value for chlordane has been used due to structural similarity.

(f) - No TACO value available. Therefore, the TACO value for endosulfan has been used due to structural similarity.

(g) - No TACO value available. Therefore, the TACO value for endrin has been used due to structural similarity.

(h) - No TACO value available. Therefore, the TACO value for naphthalene has been used due to structural similarity.

(i) - No TACO value available. Therefore, the TACO value for pyrene has been used due to structural similarity.

(j) - No TACO value, and no appropriate structural surrogate. Therefore, Region IX Preliminary Remediation Goal (PRG), 2004, used.

(k) - No TACO value, and no appropriate structural surrogate. Therefore, PRG for methyl-isobutyl-ketone.

(l) - No TACO value, PRG value, appropriate surrogate, or dose response value available.

(m) - Approach for Addressing Dioxin in Soil at CERCLA and RCRA Sites. OSWER Directive 9200.4-26. April 13, 1998.

(n) - Values for beryllium re-calculated based on new dose-response information from US EPA (Integrated Risk Information System, IRIS, 9/2005) using TACO SSL methodology as presented in Solutia, 2001, Appendix C.

(o) - Value used for 1,2-Dichloroethylene (total).

(p) - No TACO value, therefore PRG value used.

TABLE D-2
 CALCULATIONS OF TIER 1 TACO STANDARDS FOR BERYLLIUM
 USE OF CURRENT USEPA DOSE-RESPONSE VALUES
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

PARAMETER	RESIDENTIAL		INDUSTRIAL/ COMMERCIAL	CONSTRUCTION WORKER
	Noncarcinogen	Carcinogen		
AT ing (yr)	6.00	--	25.00	0.115
AT inh (yr)	30.00	--	25.00	0.115
ATc (yr)	--	70.00	70.00	70.00
BW (kg)	15.00	70.00	70.00	70.00
CONV(KG/MG)	1.00E-06	1.00E-06	1.00E-06	1.00E-06
CONV(UG/MG)	1.00E+03	1.00E+03	1.00E+03	1.00E+03
ED ing(yr)	6.00	--	25.00	1.00
ED inh(yr)	30.00	30.00	25.00	1.00
EF (d/yr)	350.00	350.00	250.00	30.00
IRsoil (mg/d)	200.00	--	50.00	480.00
PEF (m^3/kg)	1.32E+09	1.32E+09	1.24E+09	--
PEF' (m^3/kg)	--	--	--	1.24E+08
RfC (mg/m^3)	2.00E-05	--	2.00E-05	2.00E-05
RfDo (mg/(kg-d))	2.00E-03	--	2.00E-03	2.00E-03
THQ	1.00	--	1.00	1.00
TR	--	1.00E-06	1.00E-06	1.00E-06
URF (ug/m3)^-1	--	2.40E-03	2.40E-03	2.40E-03
YR(d/yr)	365.00	365.00	365.00	365.00
INGESTION: NONCARCINOGENIC	1.56E+02	--	4.09E+03	4.08E+02
INHALATION NONCARCINOGENIC	2.75E+04	--	3.62E+04	3.47E+03
CARCINOGENIC	--	1.34E+03	2.11E+03	4.40E+04

-- = Not Applicable

TACO - Tiered Approach to Corrective Action Objectives. Part 742, Subchapter F, Chapter I, Subtitle G,
 Title 35 of the Illinois Regulations, effective June 8, 1998.

**EQUATION FOR SOIL INGESTION EXPOSURE ROUTE
 NONCARCINOGENIC (MG/KG):**

$$\frac{\text{THQ} * \text{BW} * \text{AT ing} * \text{YR}}{(1/\text{RfDo}) * \text{CONV (kg/mg)} * \text{EF} * \text{ED ing} * \text{IRsoil}}$$

EQUATION FOR INHALATION EXPOSURE ROUTE

NONCARCINOGENIC (MG/KG):
 RESIDENTIAL, INDUSTRIAL/COMMERCIAL

CARCINOGENIC (MG/KG):
 RESIDENTIAL, INDUSTRIAL/COMMERCIAL

$$\frac{\text{THQ} * \text{AT inh} * \text{YR}}{\text{EF} * \text{ED inh} * (1/\text{RfC}) * (1/\text{PEF})}$$

$$\frac{\text{TR} * \text{ATc} * \text{YR}}{\text{URF} * \text{CONV(UG/MG)} * \text{EF} * \text{ED inh} * (1/\text{PEF})}$$

CONSTRUCTION WORKER

CONSTRUCTION WORKER

$$\frac{\text{THQ} * \text{AT inh} * \text{YR}}{\text{EF} * \text{ED inh} * (1/\text{RfC}) * (1/\text{PEF}')}$$

$$\frac{\text{TR} * \text{ATc} * \text{YR}}{\text{URF} * \text{CONV(UG/MG)} * \text{EF} * \text{ED inh} * (1/\text{PEF}')}$$

Attachment E

COPC Selection for Creek Bottom Soils for Residential Scenarios

TABLE E-1
SELECTION OF CONSTITUENTS OF POTENTIAL CONCERN
SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
HUMAN HEALTH RISK ASSESSMENT

Area	CAS #	Constituent	Units	Frequency of Detection	Average Concentration (Avg)	Maximum Detected Concentration (Max)	Essential Nutrient (EN)?	Sediment Background (BK) Concentration	Is Max>BK?	Pass EN/BK?	Taco Tier I Residential Direct Contact (DC) Concentration	Is Max>DC?	COPC?	Reason	Is Avg>100x DC?
CBS-CSB	71-55-6	1,1,1-Trichloroethane	mg/kg	3 : 48 : 49	4.15E-03	2.30E-02	No	ND	--	No	1.20E+03	No	No	<Tier I	No
CBS-CSB	120-82-1	1,2,4-Trichlorobenzene	mg/kg	6 : 49 : 49	2.28E+00	8.00E+01	No	ND	--	No	7.80E+02	No	No	<Tier I	No
CBS-CSB	95-50-1	1,2-Dichlorobenzene	mg/kg	6 : 49 : 49	1.67E+00	5.30E+01	No	ND	--	No	5.60E+02	No	No	<Tier I	No
CBS-CSB	540-59-0	1,2-Dichloroethene (total)	mg/kg	1 : 48 : 49	3.85E-03	1.20E-02	No	ND	--	No	7.80E+02	No	No	<Tier I	No
CBS-CSB	541-73-1	1,3-Dichlorobenzene	mg/kg	1 : 4 : 49	1.00E-01	1.00E-01	No	ND	--	No	1.30E+01	No	No	<Tier I	No
CBS-CSB	106-46-7	1,4-Dichlorobenzene	mg/kg	7 : 49 : 49	2.93E-01	5.50E+00	No	ND	--	No	3.40E+00	Yes	Yes	>Tier I	No
CBS-CSB	1746-01-6	2,3,7,8-TCDD-TEQ	mg/kg	49 : 49 : 49	2.42E-04	4.54E-03	No	1.24E-05	Yes	No	1.00E-03	Yes	Yes	>Tier I	No
CBS-CSB	93-76-5	2,4,5-T	mg/kg	12 : 48 : 49	2.42E-04	6.10E-01	No	ND	--	No	6.10E+02	No	No	<Tier I	No
CBS-CSB	93-72-1	2,4,5-TP (Silvex)	mg/kg	3 : 3 : 49	2.42E-04	2.00E-03	No	ND	--	No	6.30E+02	No	No	<Tier I	No
CBS-CSB	95-95-4	2,4,5-Trichlorophenol	mg/kg	1 : 49 : 49	2.42E-04	2.40E-01	No	ND	--	No	7.80E+03	No	No	<Tier I	No
CBS-CSB	88-06-2	2,4,6-Trichlorophenol	mg/kg	5 : 49 : 49	2.42E-04	4.30E+00	No	ND	--	No	5.80E+01	No	No	<Tier I	No
CBS-CSB	94-75-7	2,4-D	mg/kg	3 : 47 : 49	2.42E-04	1.40E-01	No	2.03E-02	Yes	No	7.80E+02	No	No	<Tier I	No
CBS-CSB	94-82-6	2,4-DB	mg/kg	2 : 47 : 49	7.60E-03	5.70E-02	No	ND	--	No	4.90E+02	No	No	<Tier I	No
CBS-CSB	120-83-2	2,4-Dichlorophenol	mg/kg	5 : 49 : 49	2.69E-01	6.60E+00	No	ND	--	No	2.30E+02	No	No	<Tier I	No
CBS-CSB	78-93-3	2-Butanone (MEK)	mg/kg	29 : 48 : 49	3.50E-02	6.10E-01	No	4.99E-02	Yes	No	7.30E+03	No	No	<Tier I	No
CBS-CSB	95-57-8	2-Chlorophenol	mg/kg	3 : 49 : 49	1.25E-01	5.10E-01	No	ND	--	No	3.90E+02	No	No	<Tier I	No
CBS-CSB	591-78-6	2-Hexanone	mg/kg	1 : 48 : 49	1.98E-02	7.70E-02	No	ND	--	No	7.90E+02	No	No	<Tier I	No
CBS-CSB	91-57-6	2-Methylnaphthalene	mg/kg	3 : 49 : 49	3.53E-01	7.30E+00	No	ND	--	No	3.10E+03	No	No	<Tier I	No
CBS-CSB	106-44-5	3&4Methylphenol	mg/kg	1 : 49 : 49	1.48E-01	1.60E+00	No	ND	--	No	3.10E+02	No	No	<Tier I	No
CBS-CSB	72-54-8	4,4'-DDD	mg/kg	3 : 49 : 49	1.60E-02	4.70E-01	No	ND	--	No	3.00E+00	No	No	<Tier I	No
CBS-CSB	72-55-9	4,4'-DDE	mg/kg	2 : 44 : 49	3.59E-03	3.50E-02	No	ND	--	No	2.00E+00	No	No	<Tier I	No
CBS-CSB	50-29-3	4,4'-DDT	mg/kg	15 : 48 : 48	1.83E-02	1.60E-01	No	ND	--	No	2.00E+00	No	No	<Tier I	No
CBS-CSB	106-47-8	4-Chloroaniline	mg/kg	5 : 49 : 49	5.94E-01	1.10E+01	No	ND	--	No	3.10E+02	No	No	<Tier I	No
CBS-CSB	108-10-1	4-Methyl-2-pentanone (MIBK)	mg/kg	5 : 48 : 49	2.03E-02	1.10E-01	No	ND	--	No	7.90E+02	No	No	<Tier I	No
CBS-CSB	100-01-6	4-Nitroaniline	mg/kg	2 : 49 : 49	7.59E-01	9.00E+00	No	ND	--	No	3.50E+00	Yes	Yes	>Tier I	No
CBS-CSB	100-02-7	4-Nitrophenol	mg/kg	1 : 1 : 49	4.40E-01	4.40E-01	No	ND	--	No	4.90E+02	No	No	<Tier I	No
CBS-CSB	83-32-9	Acenaphthene	mg/kg	2 : 49 : 49	1.32E-01	8.60E-01	No	ND	--	No	4.70E+03	No	No	<Tier I	No
CBS-CSB	208-96-8	Acenaphthylene	mg/kg	1 : 49 : 49	1.20E-01	2.40E-01	No	ND	--	No	4.70E+03	No	No	<Tier I	No
CBS-CSB	67-64-1	Acetone	mg/kg	38 : 48 : 49	1.16E-01	4.70E-01	No	1.56E-01	Yes	No	7.80E+03	No	No	<Tier I	No
CBS-CSB	309-00-2	Aldrin	mg/kg	1 : 1 : 49	3.60E-04	3.60E-04	No	ND	--	No	4.00E-02	No	No	<Tier I	No
CBS-CSB	319-84-6	alpha-BHC	mg/kg	9 : 44 : 49	5.85E-04	2.90E-03	No	ND	--	No	1.00E-01	No	No	<Tier I	No
CBS-CSB	7429-90-5	Aluminum	mg/kg	49 : 49 : 49	9.35E+03	2.00E+04	No	2.90E+04	No	Yes	7.60E+04	No	No	<Tier I	No
CBS-CSB	120-12-7	Anthracene	mg/kg	4 : 49 : 49	1.48E-01	1.40E+00	No	ND	--	No	2.30E+04	No	No	<Tier I	No
CBS-CSB	7440-36-0	Antimony	mg/kg	4 : 46 : 49	1.45E+00	3.90E+00	No	2.75E+00	Yes	No	3.10E+01	No	No	<Tier I	No
CBS-CSB	7440-38-2	Arsenic	mg/kg	49 : 49 : 49	9.72E+00	4.40E+01	No	1.44E+01	Yes	No	4.00E-01	Yes	Yes	>Tier I	No
CBS-CSB	7440-39-3	Barium	mg/kg	49 : 49 : 49	2.98E+02	1.50E+03	No	4.13E+02	Yes	No	5.50E+03	No	No	<Tier I	No
CBS-CSB	71-43-2	Benzene	mg/kg	19 : 49 : 49	8.31E-03	1.80E-01	No	ND	--	No	8.00E-01	No	No	<Tier I	No
CBS-CSB	56-55-3	Benzo(a)anthracene	mg/kg	4 : 49 : 49	1.69E-01	1.90E+00	No	ND	--	No	9.00E-01	Yes	Yes	>Tier I	No
CBS-CSB	50-32-8	Benzo(a)pyrene	mg/kg	7 : 49 : 49	1.09E-01	1.20E+00	No	ND	--	No	9.00E-02	Yes	Yes	>Tier I	No
CBS-CSB	205-99-2	Benzo(b)fluoranthene	mg/kg	6 : 49 : 49	1.56E-01	1.40E+00	No	ND	--	No	9.00E-01	Yes	Yes	>Tier I	No
CBS-CSB	191-24-2	Benzo(g,h,i)perylene	mg/kg	6 : 49 : 49	1.38E-01	8.90E-01	No	ND	--	No	2.30E+03	No	No	<Tier I	No
CBS-CSB	207-08-9	Benzo(k)fluoranthene	mg/kg	5 : 49 : 49	1.49E-01	9.00E-01	No	ND	--	No	9.00E+00	No	No	<Tier I	No

TABLE E-1
SELECTION OF CONSTITUENTS OF POTENTIAL CONCERN
SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
HUMAN HEALTH RISK ASSESSMENT

Area	CAS #	Constituent	Units	Frequency of Detection	Average Concentration (Avg)	Maximum Detected Concentration (Max)	Essential Nutrient (EN)?	Sediment Background (BK) Concentration	Is Max>BK?	Pass EN/BK?	Taco Tier I Residential Direct Contact (DC) Concentration	Is Max>DC?	COPC?	Reason	Is Avg>100x DC?
CBS-CSB	7440-41-7	Beryllium	mg/kg	36 : 49 : 49	5.39E-01	1.30E+00	No	1.56E+00	No	Yes	1.56E+02	No	No	<Tier I	No
CBS-CSB	319-85-7	beta-BHC	mg/kg	10 : 46 : 49	1.25E-03	7.70E-03	No	ND	--	No	1.00E-01	No	No	<Tier I	No
CBS-CSB	117-81-7	Bis(2-ethylhexyl)phthalate	mg/kg	5 : 49 : 49	1.77E+00	8.10E+01	No	ND	--	No	4.60E+01	Yes	Yes	>Tier I	No
CBS-CSB	85-68-7	Butylbenzylphthalate	mg/kg	2 : 49 : 49	1.80E-01	3.20E+00	No	ND	--	No	9.30E+02	No	No	<Tier I	No
CBS-CSB	7440-43-9	Cadmium	mg/kg	46 : 49 : 49	8.25E+00	5.40E+01	No	8.30E-01	Yes	No	7.80E+01	No	No	<Tier I	No
CBS-CSB	7440-70-2	Calcium	mg/kg	49 : 49 : 49	6.49E+03	2.10E+04	Yes	2.70E+04	No	Yes	NA	No	No	EN	--
CBS-CSB	86-74-8	Carbazole	mg/kg	1 : 49 : 49	1.28E-01	6.20E-01	No	ND	--	No	3.20E+01	No	No	<Tier I	No
CBS-CSB	75-15-0	Carbon disulfide	mg/kg	19 : 48 : 49	1.10E-02	7.70E-02	No	ND	--	No	7.20E+02	No	No	<Tier I	No
CBS-CSB	108-90-7	Chlorobenzene	mg/kg	38 : 49 : 49	4.50E-01	9.70E+00	No	ND	--	No	1.30E+02	No	No	<Tier I	No
CBS-CSB	67-66-3	Chloroform	mg/kg	1 : 5 : 49	2.72E-03	3.10E-03	No	ND	--	No	3.00E-01	No	No	<Tier I	No
CBS-CSB	7440-47-3	Chromium	mg/kg	49 : 49 : 49	5.13E+01	1.80E+02	No	4.00E+01	Yes	No	2.70E+02	No	No	<Tier I	No
CBS-CSB	218-01-9	Chrysene	mg/kg	5 : 49 : 49	1.67E-01	1.90E+00	No	ND	--	No	8.80E+01	No	No	<Tier I	No
CBS-CSB	7440-48-4	Cobalt	mg/kg	49 : 49 : 49	8.55E+00	2.30E+01	No	1.72E+01	Yes	No	4.70E+03	No	No	<Tier I	No
CBS-CSB	7440-50-8	Copper	mg/kg	49 : 49 : 49	4.84E+02	1.00E+04	No	3.80E+01	Yes	No	2.90E+03	Yes	Yes	>Tier I	No
CBS-CSB	57-12-5	Cyanide	mg/kg	3 : 49 : 49	3.79E-01	1.10E+00	No	ND	--	No	1.60E+03	No	No	<Tier I	No
CBS-CSB	75-99-0	Dalapon	mg/kg	1 : 5 : 49	3.95E-02	4.10E-02	No	ND	--	No	2.30E+03	No	No	<Tier I	No
CBS-CSB	319-86-8	delta-BHC	mg/kg	2 : 44 : 49	5.27E-04	4.10E-03	No	ND	--	No	1.00E-01	No	No	<Tier I	No
CBS-CSB	84-74-2	di-n-Butylphthalate	mg/kg	7 : 49 : 49	1.15E-01	2.10E-01	No	ND	--	No	2.30E+03	No	No	<Tier I	No
CBS-CSB	53-70-3	Benzo(a,h)anthracene	mg/kg	3 : 49 : 49	7.20E-02	3.40E-01	No	ND	--	No	9.00E-02	Yes	Yes	>Tier I	No
CBS-CSB	132-64-9	Dibenzofuran	mg/kg	1 : 49 : 49	1.48E-01	1.60E+00	No	ND	--	No	2.90E+02	No	No	<Tier I	No
CBS-CSB	1918-00-9	Dicamba	mg/kg	12 : 12 : 49	2.84E-03	5.30E-03	No	ND	--	No	1.80E+03	No	No	<Tier I	No
CBS-CSB	120-36-5	Dichlorprop	mg/kg	1 : 1 : 49	6.60E-03	6.60E-03	No	ND	--	No	NA	No	No	<Tier I	--
CBS-CSB	60-57-1	Diethyltin	mg/kg	8 : 47 : 49	7.72E-03	4.90E-02	No	ND	--	No	4.00E-02	Yes	Yes	>Tier I	No
CBS-CSB	33213-65-9	Endosulfan II	mg/kg	1 : 42 : 49	2.60E-03	1.00E-02	No	ND	--	No	4.70E+02	No	No	<Tier I	No
CBS-CSB	1031-07-8	Endosulfan sulfate	mg/kg	1 : 44 : 49	2.85E-03	1.20E-02	No	ND	--	No	4.70E+02	No	No	<Tier I	No
CBS-CSB	53494-70-5	Endrin ketone	mg/kg	3 : 3 : 49	9.57E-04	1.50E-03	No	ND	--	No	2.30E+01	No	No	<Tier I	No
CBS-CSB	100-41-4	Ethylbenzene	mg/kg	7 : 49 : 49	1.14E-01	3.20E+00	No	ND	--	No	4.00E+02	No	No	<Tier I	No
CBS-CSB	206-44-0	Fluoranthene	mg/kg	9 : 49 : 49	2.35E-01	4.00E+00	No	ND	--	No	3.10E+03	No	No	<Tier I	No
CBS-CSB	86-73-7	Fluorene	mg/kg	2 : 49 : 49	1.86E-01	3.50E+00	No	ND	--	No	3.10E+03	No	No	<Tier I	No
CBS-CSB	58-89-9	gamma-BHC (Lindane)	mg/kg	10 : 40 : 49	1.09E-03	2.30E-03	No	ND	--	No	5.00E-01	No	No	<Tier I	No
CBS-CSB	5103-74-2	gamma-Chlordane	mg/kg	2 : 2 : 49	3.90E-04	4.40E-04	No	ND	--	No	5.00E-01	No	No	<Tier I	No
CBS-CSB	76-44-8	Heptachlor	mg/kg	3 : 32 : 49	1.10E-03	1.20E-03	No	ND	--	No	1.00E-01	No	No	<Tier I	No
CBS-CSB	1024-57-3	Heptachlor epoxide	mg/kg	14 : 49 : 49	1.43E-02	4.10E-01	No	ND	--	No	7.00E-02	Yes	Yes	>Tier I	No
CBS-CSB	193-39-5	Indeno(1,2,3-cd)pyrene	mg/kg	4 : 49 : 49	1.39E-01	8.30E-01	No	ND	--	No	9.00E-01	No	No	<Tier I	No
CBS-CSB	7439-89-6	Iron	mg/kg	49 : 49 : 49	1.38E+04	2.80E+04	Yes	4.13E+04	No	Yes	NA	No	No	EN	--
CBS-CSB	7439-92-1	Lead	mg/kg	49 : 49 : 49	7.46E+01	7.00E+02	No	4.38E+01	Yes	No	4.00E+02	Yes	No	Aug <Tier 1 (a)	No
CBS-CSB	7439-95-4	Magnesium	mg/kg	49 : 49 : 49	3.72E+03	6.90E+03	Yes	1.03E+04	No	Yes	NA	No	No	EN	--
CBS-CSB	7439-96-5	Manganese	mg/kg	49 : 49 : 49	1.30E+02	5.30E+02	No	1.42E+03	No	Yes	3.70E+03	No	No	<Tier I	No
CBS-CSB	7085-19-0	MCPP	mg/kg	3 : 47 : 49	1.61E+00	6.10E+00	No	ND	--	No	6.10E+01	No	No	<Tier I	No
CBS-CSB	7439-97-6	Mercury	mg/kg	48 : 49 : 49	1.34E-01	8.40E-01	No	9.60E-02	Yes	No	1.00E+01	No	No	<Tier I	No
CBS-CSB	72-43-5	Methoxychlor	mg/kg	6 : 6 : 49	1.72E-03	6.60E-03	No	ND	--	No	3.90E+02	No	No	<Tier I	No
CBS-CSB	75-09-2	Methylene chloride	mg/kg	4 : 6 : 49	2.39E-03	2.90E-03	No	ND	--	No	1.30E+01	No	No	<Tier I	No
CBS-CSB	7439-98-7	Molybdenum	mg/kg	27 : 49 : 49	7.79E-01	2.80E+00	No	8.90E-01	Yes	No	3.90E+02	No	No	<Tier I	No

TABLE E-1
SELECTION OF CONSTITUENTS OF POTENTIAL CONCERN
SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
HUMAN HEALTH RISK ASSESSMENT

Area	CAS #	Constituent	Units	Frequency of Detection	Average Concentration (Avg)	Maximum Detected Concentration (Max)	Essential Nutrient (EN)?	Sediment Background (BK) Concentration	Is Max>BK?	Pass EN/BK?	Taco Tier I Residential Direct Contact (DC) Concentration	Is Max>DC?	COPC?	Reason	Is Avg>100x DC?
CBS-CSB	86-30-6	N-Nitrosodiphenylamine	mg/kg	4 : 49 : 49	1.37E-01	1.20E+00	No	ND	--	No	1.30E+02	No	No	<Tier I	No
CBS-CSB	91-20-3	Naphthalene	mg/kg	5 : 49 : 49	2.61E-01	6.00E+00	No	ND	--	No	3.10E+03	No	No	<Tier I	No
CBS-CSB	7440-02-0	Nickel	mg/kg	49 : 49 : 49	1.92E+02	6.30E+02	No	4.28E+01	Yes	No	1.60E+03	No	No	<Tier I	No
CBS-CSB	98-95-3	Nitrobenzene	mg/kg	2 : 49 : 49	1.27E-01	5.20E-01	No	ND	--	No	3.90E+01	No	No	<Tier I	No
CBS-CSB	87-86-5	Pentachlorophenol	mg/kg	37 : 49 : 49	9.87E-01	4.40E+01	No	7.52E-01	Yes	No	3.00E+00	Yes	Yes	>Tier I	No
CBS-CSB	85-01-8	Phenanthrene	mg/kg	6 : 49 : 49	3.01E-01	7.00E+00	No	ND	--	No	2.30E+04	No	No	<Tier I	No
CBS-CSB	108-95-2	Phenol	mg/kg	3 : 49 : 49	1.85E-01	3.40E+00	No	ND	--	No	4.70E+04	No	No	<Tier I	No
CBS-CSB	7440-09-7	Potassium	mg/kg	49 : 49 : 49	1.76E+03	3.20E+03	Yes	4.20E+03	No	Yes	NA	No	No	EN	--
CBS-CSB	129-00-0	Pyrene	mg/kg	5 : 49 : 49	2.42E-01	4.00E+00	No	ND	--	No	2.30E+03	No	No	<Tier I	No
CBS-CSB	7782-49-2	Selenium	mg/kg	2 : 49 : 49	8.09E-01	4.50E+00	No	ND	--	No	3.90E+02	No	No	<Tier I	No
CBS-CSB	7440-22-4	Silver	mg/kg	10 : 49 : 49	7.78E-01	9.00E+00	No	ND	--	No	3.90E+02	No	No	<Tier I	No
CBS-CSB	7440-23-5	Sodium	mg/kg	49 : 49 : 49	1.99E+02	6.70E+02	Yes	ND	--	Yes	NA	No	No	EN	--
CBS-CSB	100-42-5	Styrene	mg/kg	1 : 3 : 49	2.50E-03	2.80E-03	No	ND	--	No	1.50E+03	No	No	<Tier I	No
CBS-CSB	127-18-4	Tetrachloroethene	mg/kg	3 : 48 : 49	5.27E-03	7.00E-02	No	ND	--	No	1.10E+01	No	No	<Tier I	No
CBS-CSB	7440-28-0	Thallium	mg/kg	3 : 49 : 49	6.29E-01	1.30E+00	No	ND	--	No	6.30E+00	No	No	<Tier I	No
CBS-CSB	7440-31-5	Tin	mg/kg	9 : 49 : 49	1.44E+01	4.70E+02	No	ND	--	No	4.70E+04	No	No	<Tier I	No
CBS-CSB	108-88-3	Toluene	mg/kg	16 : 49 : 49	1.46E-02	2.90E-01	No	ND	--	No	6.50E+02	No	No	<Tier I	No
CBS-CSB	1336-36-3	Total PCBs	mg/kg	38 : 49 : 49	2.78E+00	8.61E+01	No	ND	--	No	1.00E+00	Yes	Yes	>Tier I	No
CBS-CSB	79-01-6	Trichloroethene	mg/kg	3 : 48 : 49	4.48E-03	3.40E-02	No	ND	--	No	5.00E+00	No	No	<Tier I	No
CBS-CSB	7440-62-2	Vanadium	mg/kg	49 : 49 : 49	2.53E+01	4.70E+01	No	6.98E+01	No	Yes	5.50E+02	No	No	<Tier I	No
CBS-CSB	1330-20-7	Xylenes (total)	mg/kg	13 : 49 : 49	7.64E-01	2.90E+01	No	ND	--	No	4.10E+02	No	No	<Tier I	No
CBS-CSB	7440-66-6	Zinc	mg/kg	49 : 49 : 49	2.16E+03	1.05E+04	No	1.66E+02	Yes	No	2.30E+04	No	No	<Tier I	No
CBS-CSC	1746-01-6	2,3,7,8-TCDD-TEQ	mg/kg	9 : 9 : 9	1.12E-05	3.66E-05	No	1.24E-05	Yes	No	1.00E-03	No	No	<Tier I	No
CBS-CSC	78-93-3	2-Butanone (MEK)	mg/kg	3 : 3 : 9	7.60E-03	9.90E-03	No	4.99E-02	No	Yes	7.30E+03	No	No	<Tier I	No
CBS-CSC	67-64-1	Acetone	mg/kg	5 : 9 : 9	3.42E-02	8.30E-02	No	1.56E-01	No	Yes	7.80E+03	No	No	<Tier I	No
CBS-CSC	5103-71-9	alpha-Chlordane	mg/kg	1 : 1 : 9	9.20E-04	9.20E-04	No	ND	--	No	5.00E-01	No	No	<Tier I	No
CBS-CSC	7429-90-5	Aluminum	mg/kg	9 : 9 : 9	1.08E+04	1.30E+04	No	2.90E+04	No	Yes	7.60E+04	No	No	<Tier I	No
CBS-CSC	7440-36-0	Antimony	mg/kg	1 : 1 : 9	7.90E-01	7.90E-01	No	2.75E+00	No	Yes	3.10E+01	No	No	<Tier I	No
CBS-CSC	7440-38-2	Arsenic	mg/kg	9 : 9 : 9	9.70E+00	1.40E+01	No	1.44E+01	No	Yes	4.00E-01	Yes	No	<BK	No
CBS-CSC	7440-39-3	Barium	mg/kg	9 : 9 : 9	2.49E+02	3.30E+02	No	4.13E+02	No	Yes	5.50E+03	No	No	<Tier I	No
CBS-CSC	71-43-2	Benzene	mg/kg	1 : 1 : 9	3.00E-03	3.00E-03	No	ND	--	No	8.00E-01	No	No	<Tier I	No
CBS-CSC	191-24-2	Benz(g,h,i)perylene	mg/kg	1 : 1 : 9	6.50E-02	6.50E-02	No	ND	--	No	2.30E+03	No	No	<Tier I	No
CBS-CSC	7440-41-7	Beryllium	mg/kg	9 : 9 : 9	8.28E-01	9.60E-01	No	1.56E+00	No	Yes	1.56E+02	No	No	<Tier I	No
CBS-CSC	7440-43-9	Cadmium	mg/kg	9 : 9 : 9	1.33E+01	2.40E+01	No	8.30E-01	Yes	No	7.80E+01	No	No	<Tier I	No
CBS-CSC	7440-70-2	Calcium	mg/kg	9 : 9 : 9	7.81E+03	1.40E+04	Yes	2.70E+04	No	Yes	NA	No	No	EN	--
CBS-CSC	108-90-7	Chlorobenzene	mg/kg	9 : 9 : 9	1.30E-01	7.00E-01	No	ND	--	No	1.30E+02	No	No	<Tier I	No
CBS-CSC	7440-47-3	Chromium	mg/kg	9 : 9 : 9	3.61E+01	1.10E+02	No	4.00E+01	Yes	No	2.70E+02	No	No	<Tier I	No
CBS-CSC	7440-48-4	Cobalt	mg/kg	9 : 9 : 9	9.41E+00	1.40E+01	No	1.72E+01	No	Yes	4.70E+03	No	No	<Tier I	No
CBS-CSC	7440-50-8	Copper	mg/kg	9 : 9 : 9	1.09E+02	2.50E+02	No	3.80E+01	Yes	No	2.90E+03	No	No	<Tier I	No
CBS-CSC	319-86-8	delta-BHC	mg/kg	3 : 6 : 9	6.65E-04	9.90E-04	No	ND	--	No	1.00E-01	No	No	<Tier I	No
CBS-CSC	1918-00-9	Dicamba	mg/kg	1 : 1 : 9	6.60E-03	6.60E-03	No	ND	--	No	1.80E+03	No	No	<Tier I	No
CBS-CSC	120-36-5	Dichlorprop	mg/kg	1 : 1 : 9	6.20E-03	6.20E-03	No	ND	--	No	NA	No	No	<Tier I	--
CBS-CSC	60-57-1	Dieldrin	mg/kg	8 : 9 : 9	4.76E-03	1.10E-02	No	ND	--	No	4.00E-02	No	No	<Tier I	No

TABLE E-1
SELECTION OF CONSTITUENTS OF POTENTIAL CONCERN
SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
HUMAN HEALTH RISK ASSESSMENT

Area	CAS #	Constituent	Units	Frequency of Detection	Average Concentration (Avg)	Maximum Detected Concentration (Max)	Essential Nutrient (EN)?	Sediment Background (BK) Concentration	Is Max>BK?	Pass EN/BK?	Taco Tier I Residential Direct Contact (DC) Concentration	Is Max>DC?	COPC?	Reason	Is Avg>100x DC?
CBS-CSC	1031-07-8	Endosulfan sulfate	mg/kg	3 : 7 : 9	4.17E-03	7.00E-03	No	ND	--	No	4.70E+02	No	No	<Tier I	No
CBS-CSC	53494-70-5	Endrin ketone	mg/kg	1 : 6 : 9	5.73E-03	1.00E-02	No	ND	--	No	2.30E+01	No	No	<Tier I	No
CBS-CSC	5103-74-2	gamma-Chlordane	mg/kg	1 : 1 : 9	1.10E-03	1.10E-03	No	ND	--	No	5.00E-01	No	No	<Tier I	No
CBS-CSC	7439-89-6	Iron	mg/kg	9 : 9 : 9	1.76E+04	2.10E+04	Yes	4.13E+04	No	Yes	NA	No	No	EN	--
CBS-CSC	7439-92-1	Lead	mg/kg	9 : 9 : 9	4.32E+01	1.40E+02	No	4.38E+01	Yes	No	4.00E+02	No	No	<Tier I	No
CBS-CSC	7439-95-4	Magnesium	mg/kg	9 : 9 : 9	4.43E+03	6.70E+03	Yes	1.03E+04	No	Yes	NA	No	No	EN	--
CBS-CSC	7439-96-5	Manganese	mg/kg	9 : 9 : 9	1.89E+02	3.90E+02	No	1.42E+03	No	Yes	3.70E+03	No	No	<Tier I	No
CBS-CSC	7439-97-6	Mercury	mg/kg	9 : 9 : 9	9.56E-02	3.10E-01	No	9.60E-02	Yes	No	1.00E+01	No	No	<Tier I	No
CBS-CSC	72-43-5	Methoxychlor	mg/kg	3 : 3 : 9	4.15E-03	7.10E-03	No	ND	--	No	3.90E+02	No	No	<Tier I	No
CBS-CSC	75-09-2	Methylene chloride	mg/kg	4 : 9 : 9	3.47E-03	4.80E-03	No	ND	--	No	1.30E+01	No	No	<Tier I	No
CBS-CSC	7440-02-0	Nickel	mg/kg	9 : 9 : 9	2.63E+02	5.70E+02	No	4.28E+01	Yes	No	1.60E+03	No	No	<Tier I	No
CBS-CSC	87-86-5	Pentachlorophenol	mg/kg	7 : 9 : 9	6.06E-03	1.40E-02	No	7.52E-01	No	Yes	3.00E+00	No	No	<Tier I	No
CBS-CSC	85-01-8	Phenanthrene	mg/kg	1 : 1 : 9	2.50E-02	2.50E-02	No	ND	--	No	2.30E+04	No	No	<Tier I	No
CBS-CSC	7440-09-7	Potassium	mg/kg	9 : 9 : 9	1.87E+03	2.30E+03	Yes	4.20E+03	No	Yes	NA	No	No	EN	--
CBS-CSC	7440-23-5	Sodium	mg/kg	9 : 9 : 9	1.24E+02	2.00E+02	Yes	ND	--	Yes	NA	No	No	EN	--
CBS-CSC	100-42-5	Styrene	mg/kg	1 : 1 : 9	2.70E-03	2.70E-03	No	ND	--	No	1.50E+03	No	No	<Tier I	No
CBS-CSC	7440-31-5	Tin	mg/kg	1 : 9 : 9	3.93E+00	7.50E+00	No	ND	--	No	4.70E+04	No	No	<Tier I	No
CBS-CSC	108-88-3	Toluene	mg/kg	4 : 9 : 9	4.13E-03	7.50E-03	No	ND	--	No	6.50E+02	No	No	<Tier I	No
CBS-CSC	1336-36-3	Total PCBs	mg/kg	6 : 9 : 9	6.91E-02	1.78E-01	No	ND	--	No	1.00E+00	No	No	<Tier I	No
CBS-CSC	7440-62-2	Vanadium	mg/kg	9 : 9 : 9	3.10E+01	3.70E+01	No	6.98E+01	No	Yes	5.50E+02	No	No	<Tier I	No
CBS-CSC	1330-20-7	Xylenes (total)	mg/kg	1 : 9 : 9	3.74E-03	4.30E-03	No	ND	--	No	4.10E+02	No	No	<Tier I	No
CBS-CSC	7440-66-6	Zinc	mg/kg	9 : 9 : 9	2.14E+03	3.40E+03	No	1.66E+02	Yes	No	2.30E+04	No	No	<Tier I	No
CBS-CSD	106-46-7	1,4-Dichlorobenzene	mg/kg	2 : 6 : 6	1.12E-01	1.30E-01	No	ND	--	No	3.40E+00	No	No	<Tier I	No
CBS-CSD	1746-01-6	2,3,7,8-TCDD-TEQ	mg/kg	6 : 6 : 6	1.65E-04	8.86E-04	No	1.24E-05	Yes	No	1.00E-03	No	No	<Tier I	No
CBS-CSD	93-76-5	2,4,5-T	mg/kg	1 : 1 : 6	5.40E-03	5.40E-03	No	ND	--	No	6.10E+02	No	No	<Tier I	No
CBS-CSD	78-93-3	2-Butanone (MEK)	mg/kg	3 : 3 : 6	8.07E-03	1.00E-02	No	4.99E-02	No	Yes	7.30E+03	No	No	<Tier I	No
CBS-CSD	72-54-8	4,4'-DDD	mg/kg	1 : 1 : 6	1.40E-03	1.40E-03	No	ND	--	No	3.00E+00	No	No	<Tier I	No
CBS-CSD	50-29-3	4,4'-DDT	mg/kg	1 : 6 : 6	5.62E-02	2.40E-01	No	ND	--	No	2.00E+00	No	No	<Tier I	No
CBS-CSD	309-00-2	Aldrin	mg/kg	2 : 5 : 6	5.03E-03	9.00E-03	No	ND	--	No	4.00E-02	No	No	<Tier I	No
CBS-CSD	5103-71-9	alpha-Chlordane	mg/kg	1 : 5 : 6	6.78E-03	1.20E-02	No	ND	--	No	5.00E-01	No	No	<Tier I	No
CBS-CSD	7429-90-5	Aluminum	mg/kg	6 : 6 : 6	1.09E+04	1.40E+04	No	2.90E+04	No	Yes	7.60E+04	No	No	<Tier I	No
CBS-CSD	7440-38-2	Arsenic	mg/kg	6 : 6 : 6	1.14E+01	1.80E+01	No	1.44E+01	Yes	No	4.00E-01	Yes	Yes	>Tier I	No
CBS-CSD	7440-39-3	Barium	mg/kg	6 : 6 : 6	3.12E+02	5.70E+02	No	4.13E+02	Yes	No	5.50E+03	No	No	<Tier I	No
CBS-CSD	50-32-8	Benzo(a)pyrene	mg/kg	3 : 6 : 6	8.48E-02	1.40E-01	No	ND	--	No	9.00E-02	Yes	Yes	>Tier I	No
CBS-CSD	205-99-2	Benzo(b)fluoranthene	mg/kg	1 : 6 : 6	1.36E-01	2.00E-01	No	ND	--	No	9.00E-01	No	No	<Tier I	No
CBS-CSD	191-24-2	Benzo(g,h,i)perylene	mg/kg	2 : 6 : 6	1.40E-01	2.20E-01	No	ND	--	No	2.30E+03	No	No	<Tier I	No
CBS-CSD	207-08-9	Benzo(k)fluoranthene	mg/kg	1 : 6 : 6	1.38E-01	2.10E-01	No	ND	--	No	9.00E+00	No	No	<Tier I	No
CBS-CSD	7440-41-7	Beryllium	mg/kg	6 : 6 : 6	8.38E-01	9.90E-01	No	1.56E+00	No	Yes	1.56E+02	No	No	<Tier I	No
CBS-CSD	7440-43-9	Cadmium	mg/kg	6 : 6 : 6	1.98E+01	4.00E+01	No	8.30E-01	Yes	No	7.80E+01	No	No	<Tier I	No
CBS-CSD	7440-70-2	Calcium	mg/kg	6 : 6 : 6	8.53E+03	2.50E+04	Yes	2.70E+04	No	Yes	NA	No	No	EN	--
CBS-CSD	108-90-7	Chlorobenzene	mg/kg	5 : 6 : 6	3.13E-02	1.50E-01	No	ND	--	No	1.30E+02	No	No	<Tier I	No
CBS-CSD	7440-47-3	Chromium	mg/kg	6 : 6 : 6	4.93E+01	5.70E+01	No	4.00E+01	Yes	No	2.70E+02	No	No	<Tier I	No
CBS-CSD	7440-48-4	Cobalt	mg/kg	6 : 6 : 6	9.47E+00	1.20E+01	No	1.72E+01	No	Yes	4.70E+03	No	No	<Tier I	No

TABLE E-1
SELECTION OF CONSTITUENTS OF POTENTIAL CONCERN
SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
HUMAN HEALTH RISK ASSESSMENT

Area	CAS #	Constituent	Units	Frequency of Detection	Average Concentration (Avg)	Maximum Detected Concentration (Max)	Essential Nutrient (EN)?	Sediment Background (BK) Concentration	Is Max>BK?	Pass EN/BK?	Taco Tier I Residential Direct Contact (DC) Concentration	Is Max>DC?	COPC?	Reason	Is Avg>100x DC?
CBS-CSD	7440-50-8	Copper	mg/kg	6 : 6 : 6	3.86E+02	1.60E+03	No	3.80E+01	Yes	No	2.90E+03	No	No	<Tier I	No
CBS-CSD	75-99-0	Dalapon	mg/kg	1 : 6 : 6	4.75E-02	5.00E-02	No	ND	--	No	2.30E+03	No	No	<Tier I	No
CBS-CSD	319-86-8	delta-BHC	mg/kg	4 : 5 : 6	8.24E-04	1.90E-03	No	ND	--	No	1.00E-01	No	No	<Tier I	No
CBS-CSD	1918-00-9	Dicamba	mg/kg	1 : 1 : 6	1.80E-03	1.80E-03	No	ND	--	No	1.80E+03	No	No	<Tier I	No
CBS-CSD	120-36-5	Dichlorprop	mg/kg	1 : 1 : 6	2.10E-02	2.10E-02	No	ND	--	No	NA	No	No	<Tier I	--
CBS-CSD	60-57-1	Dieldrin	mg/kg	5 : 6 : 6	1.27E-01	6.90E-01	No	ND	--	No	4.00E-02	Yes	Yes	>Tier I	No
CBS-CSD	1031-07-8	Endosulfan sulfate	mg/kg	1 : 2 : 6	7.10E-03	9.50E-03	No	ND	--	No	4.70E+02	No	No	<Tier I	No
CBS-CSD	206-44-0	Fluoranthene	mg/kg	4 : 6 : 6	1.31E-01	1.90E-01	No	ND	--	No	3.10E+03	No	No	<Tier I	No
CBS-CSD	5103-74-2	gamma-Chlordane	mg/kg	2 : 6 : 6	1.55E-02	6.70E-02	No	ND	--	No	5.00E-01	No	No	<Tier I	No
CBS-CSD	193-39-5	Indeno(1,2,3-cd)pyrene	mg/kg	2 : 6 : 6	1.30E-01	1.80E-01	No	ND	--	No	9.00E-01	No	No	<Tier I	No
CBS-CSD	7439-89-6	Iron	mg/kg	6 : 6 : 6	1.72E+04	2.00E+04	Yes	4.13E+04	No	Yes	NA	No	No	EN	--
CBS-CSD	7439-92-1	Lead	mg/kg	6 : 6 : 6	9.82E+01	2.80E+02	No	4.38E+01	Yes	No	4.00E+02	No	No	<Tier I	No
CBS-CSD	7439-95-4	Magnesium	mg/kg	6 : 6 : 6	3.77E+03	5.00E+03	Yes	1.03E+04	No	Yes	NA	No	No	EN	--
CBS-CSD	7439-96-5	Manganese	mg/kg	6 : 6 : 6	1.37E+02	1.90E+02	No	1.42E+03	No	Yes	3.70E+03	No	No	<Tier I	No
CBS-CSD	7439-97-6	Mercury	mg/kg	6 : 6 : 6	2.38E-01	7.10E-01	No	9.60E-02	Yes	No	1.00E+01	No	No	<Tier I	No
CBS-CSD	72-43-5	Methoxychlor	mg/kg	3 : 4 : 6	2.47E-02	6.20E-02	No	ND	--	No	3.90E+02	No	No	<Tier I	No
CBS-CSD	75-09-2	Methylene chloride	mg/kg	4 : 4 : 6	2.68E-03	3.20E-03	No	ND	--	No	1.30E+01	No	No	<Tier I	No
CBS-CSD	7439-98-7	Molybdenum	mg/kg	2 : 6 : 6	2.33E+00	7.00E+00	No	8.90E-01	Yes	No	3.90E+02	No	No	<Tier I	No
CBS-CSD	7440-02-0	Nickel	mg/kg	6 : 6 : 6	2.87E+02	5.30E+02	No	4.28E+01	Yes	No	1.60E+03	No	No	<Tier I	No
CBS-CSD	87-86-5	Pentachlorophenol	mg/kg	5 : 6 : 6	6.90E-03	1.30E-02	No	7.52E-01	No	Yes	3.00E+00	No	No	<Tier I	No
CBS-CSD	85-01-8	Phenanthrene	mg/kg	2 : 4 : 6	1.01E-01	1.20E-01	No	ND	--	No	2.30E+04	No	No	<Tier I	No
CBS-CSD	7440-09-7	Potassium	mg/kg	6 : 6 : 6	1.80E+03	2.10E+03	Yes	4.20E+03	No	Yes	NA	No	No	EN	--
CBS-CSD	129-00-0	Pyrene	mg/kg	3 : 6 : 6	1.32E-01	1.60E-01	No	ND	--	No	2.30E+03	No	No	<Tier I	No
CBS-CSD	7782-49-2	Selenium	mg/kg	1 : 5 : 6	1.27E+00	2.80E+00	No	ND	--	No	3.90E+02	No	No	<Tier I	No
CBS-CSD	7440-22-4	Silver	mg/kg	1 : 6 : 6	8.25E-01	1.50E+00	No	ND	--	No	3.90E+02	No	No	<Tier I	No
CBS-CSD	7440-23-5	Sodium	mg/kg	6 : 6 : 6	1.75E+02	3.30E+02	Yes	ND	--	Yes	NA	No	No	EN	--
CBS-CSD	7440-31-5	Tin	mg/kg	2 : 6 : 6	5.23E+00	1.10E+01	No	ND	--	No	4.70E+04	No	No	<Tier I	No
CBS-CSD	108-88-3	Toluene	mg/kg	1 : 1 : 6	2.90E-03	2.90E-03	No	ND	--	No	6.50E+02	No	No	<Tier I	No
CBS-CSD	1336-36-3	Total PCBs	mg/kg	5 : 6 : 6	4.92E-01	2.44E+00	No	ND	--	No	1.00E+00	Yes	Yes	>Tier I	No
CBS-CSD	7440-62-2	Vanadium	mg/kg	6 : 6 : 6	3.15E+01	3.60E+01	No	6.98E+01	No	Yes	5.50E+02	No	No	<Tier I	No
CBS-CSD	7440-66-6	Zinc	mg/kg	6 : 6 : 6	4.10E+03	8.20E+03	No	1.66E+02	Yes	No	2.30E+04	No	No	<Tier I	No
CBS-CSE	106-46-7	1,4-Dichlorobenzene	mg/kg	1 : 17 : 17	1.30E-01	2.30E-01	No	ND	--	No	3.40E+00	No	No	<Tier I	No
CBS-CSE	1746-01-6	2,3,7,8-TCDD-TEQ	mg/kg	14 : 17 : 17	3.06E-05	1.05E-04	No	1.24E-05	Yes	No	1.00E-03	No	No	<Tier I	No
CBS-CSE	94-75-7	2,4-D	mg/kg	2 : 17 : 17	8.34E-03	3.50E-02	No	2.03E-02	Yes	No	7.80E+02	No	No	<Tier I	No
CBS-CSE	78-93-3	2-Butanone (MEK)	mg/kg	5 : 5 : 17	1.06E-02	1.40E-02	No	4.99E-02	No	Yes	7.30E+03	No	No	<Tier I	No
CBS-CSE	72-54-8	4,4'-DDD	mg/kg	2 : 17 : 17	6.19E-03	4.70E-02	No	ND	--	No	3.00E+00	No	No	<Tier I	No
CBS-CSE	72-55-9	4,4'-DDE	mg/kg	6 : 15 : 17	2.06E-03	7.20E-03	No	ND	--	No	2.00E+00	No	No	<Tier I	No
CBS-CSE	50-29-3	4,4'-DDT	mg/kg	7 : 17 : 17	4.53E-03	1.70E-02	No	ND	--	No	2.00E+00	No	No	<Tier I	No
CBS-CSE	67-64-1	Acetone	mg/kg	9 : 17 : 17	3.78E-02	7.30E-02	No	1.56E-01	No	Yes	7.80E+03	No	No	<Tier I	No
CBS-CSE	319-84-6	alpha-BHC	mg/kg	1 : 15 : 17	4.21E-04	1.30E-03	No	ND	--	No	1.00E-01	No	No	<Tier I	No
CBS-CSE	5103-71-9	alpha-Chlordane	mg/kg	1 : 17 : 17	2.31E-03	8.70E-03	No	ND	--	No	5.00E-01	No	No	<Tier I	No
CBS-CSE	7429-90-5	Aluminum	mg/kg	17 : 17 : 17	9.97E+03	1.40E+04	No	2.90E+04	No	Yes	7.60E+04	No	No	<Tier I	No
CBS-CSE	120-12-7	Anthracene	mg/kg	1 : 1 : 17	5.00E-02	5.00E-02	No	ND	--	No	2.30E+04	No	No	<Tier I	No

TABLE E-1
SELECTION OF CONSTITUENTS OF POTENTIAL CONCERN
SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
HUMAN HEALTH RISK ASSESSMENT

Area	CAS #	Constituent	Units	Frequency of Detection	Average Concentration (Avg)	Maximum Detected Concentration (Max)	Essential Nutrient (EN)?	Sediment Background (BK) Concentration	Is Max>BK?	Pass EN/BK?	Taco Tier I Residential Direct Contact (DC) Concentration	Is Max>DC?	COPC?	Reason	Is Avg>100x DC?
CBS-CSE	7440-36-0	Antimony	mg/kg	3 : 17 : 17	1.43E+00	4.70E+00	No	2.75E+00	Yes	No	3.10E+01	No	No	<Tier I	No
CBS-CSE	7440-38-2	Arsenic	mg/kg	16 : 17 : 17	8.08E+00	2.00E+01	No	1.44E+01	Yes	No	4.00E-01	Yes	Yes	>Tier I	No
CBS-CSE	7440-39-3	Barium	mg/kg	17 : 17 : 17	2.52E+02	6.40E+02	No	4.13E+02	Yes	No	5.50E+03	No	No	<Tier I	No
CBS-CSE	56-55-3	Benz(a)anthracene	mg/kg	3 : 17 : 17	1.26E-01	2.60E-01	No	ND	--	No	9.00E-01	No	No	<Tier I	No
CBS-CSE	50-32-8	Benz(a)pyrene	mg/kg	3 : 17 : 17	8.97E-02	4.20E-01	No	ND	--	No	9.00E-02	Yes	Yes	>Tier I	No
CBS-CSE	205-99-2	Benz(b)fluoranthene	mg/kg	4 : 17 : 17	1.41E-01	5.10E-01	No	ND	--	No	9.00E-01	No	No	<Tier I	No
CBS-CSE	191-24-2	Benz(g,h,i)perylene	mg/kg	3 : 17 : 17	1.35E-01	3.50E-01	No	ND	--	No	2.30E+03	No	No	<Tier I	No
CBS-CSE	207-08-9	Benz(k)fluoranthene	mg/kg	3 : 17 : 17	1.35E-01	3.70E-01	No	ND	--	No	9.00E+00	No	No	<Tier I	No
CBS-CSE	7440-41-7	Beryllium	mg/kg	17 : 17 : 17	7.44E-01	1.10E+00	No	1.56E+00	No	Yes	1.56E+02	No	No	<Tier I	No
CBS-CSE	117-81-7	Bis(2-ethylhexyl)phthalate	mg/kg	1 : 1 : 17	7.70E-02	7.70E-02	No	ND	--	No	4.60E+01	No	No	<Tier I	No
CBS-CSE	7440-43-9	Cadmium	mg/kg	17 : 17 : 17	1.42E+01	3.80E+01	No	8.30E-01	Yes	No	7.80E+01	No	No	<Tier I	No
CBS-CSE	7440-70-2	Calcium	mg/kg	17 : 17 : 17	8.02E+03	1.30E+04	Yes	2.70E+04	No	Yes	NA	No	No	EN	--
CBS-CSE	108-90-7	Chlorobenzene	mg/kg	12 : 17 : 17	2.33E-02	2.10E-01	No	ND	--	No	1.30E+02	No	No	<Tier I	No
CBS-CSE	7440-47-3	Chromium	mg/kg	17 : 17 : 17	4.73E+01	1.70E+02	No	4.00E+01	Yes	No	2.70E+02	No	No	<Tier I	No
CBS-CSE	218-01-9	Chrysene	mg/kg	4 : 17 : 17	1.32E-01	3.70E-01	No	ND	--	No	8.80E+01	No	No	<Tier I	No
CBS-CSE	7440-48-4	Cobalt	mg/kg	17 : 17 : 17	8.08E+00	1.30E+01	No	1.72E+01	No	Yes	4.70E+03	No	No	<Tier I	No
CBS-CSE	7440-50-8	Copper	mg/kg	17 : 17 : 17	4.25E+02	4.30E+03	No	3.80E+01	Yes	No	2.90E+03	Yes	Yes	>Tier I	No
CBS-CSE	84-74-2	di-n-Butylphthalate	mg/kg	1 : 1 : 17	7.40E-02	7.40E-02	No	ND	--	No	2.30E+03	No	No	<Tier I	No
CBS-CSE	53-70-3	Dibenzo(a,h)anthracene	mg/kg	1 : 17 : 17	6.93E-02	1.40E-01	No	ND	--	No	9.00E-02	Yes	Yes	>Tier I	No
CBS-CSE	1918-00-9	Dicamba	mg/kg	1 : 1 : 17	2.50E-03	2.50E-03	No	ND	--	No	1.80E+03	No	No	<Tier I	No
CBS-CSE	60-57-1	Dieldrin	mg/kg	13 : 17 : 17	5.49E-03	3.40E-02	No	ND	--	No	4.00E-02	No	No	<Tier I	No
CBS-CSE	959-98-8	Endosulfan I	mg/kg	3 : 3 : 17	1.43E-04	1.70E-04	No	ND	--	No	4.70E+02	No	No	<Tier I	No
CBS-CSE	33213-65-9	Endosulfan II	mg/kg	1 : 1 : 17	6.60E-04	6.60E-04	No	ND	--	No	4.70E+02	No	No	<Tier I	No
CBS-CSE	1031-07-8	Endosulfan sulfate	mg/kg	2 : 17 : 17	3.56E-03	1.60E-02	No	ND	--	No	4.70E+02	No	No	<Tier I	No
CBS-CSE	100-41-4	Ethylbenzene	mg/kg	1 : 17 : 17	3.64E-03	4.90E-03	No	ND	--	No	4.00E+02	No	No	<Tier I	No
CBS-CSE	206-44-0	Fluoranthene	mg/kg	4 : 17 : 17	1.63E-01	7.10E-01	No	ND	--	No	3.10E+03	No	No	<Tier I	No
CBS-CSE	5103-74-2	gamma-Chlordane	mg/kg	2 : 16 : 17	1.66E-03	5.50E-03	No	ND	--	No	5.00E-01	No	No	<Tier I	No
CBS-CSE	1024-57-3	Heptachlor epoxide	mg/kg	5 : 5 : 17	4.34E-04	5.90E-04	No	ND	--	No	7.00E-02	No	No	<Tier I	No
CBS-CSE	193-39-5	Indeno(1,2,3-cd)pyrene	mg/kg	2 : 17 : 17	1.38E-01	3.50E-01	No	ND	--	No	9.00E-01	No	No	<Tier I	No
CBS-CSE	7439-89-6	Iron	mg/kg	17 : 17 : 17	1.78E+04	2.70E+04	Yes	4.13E+04	No	Yes	NA	No	No	EN	--
CBS-CSE	7439-92-1	Lead	mg/kg	17 : 17 : 17	7.85E+01	4.00E+02	No	4.38E+01	Yes	No	4.00E+02	No	No	<Tier I	No
CBS-CSE	7439-95-4	Magnesium	mg/kg	17 : 17 : 17	4.51E+03	6.90E+03	Yes	1.03E+04	No	Yes	NA	No	No	EN	--
CBS-CSE	7439-96-5	Manganese	mg/kg	17 : 17 : 17	1.73E+02	3.00E+02	No	1.42E+03	No	Yes	3.70E+03	No	No	<Tier I	No
CBS-CSE	7439-97-6	Mercury	mg/kg	17 : 17 : 17	4.06E-01	1.60E+00	No	9.60E-02	Yes	No	1.00E+01	No	No	<Tier I	No
CBS-CSE	72-43-5	Methoxychlor	mg/kg	3 : 3 : 17	7.20E-04	8.90E-04	No	ND	--	No	3.90E+02	No	No	<Tier I	No
CBS-CSE	75-09-2	Methylene chloride	mg/kg	3 : 6 : 17	2.78E-03	3.25E-03	No	ND	--	No	1.30E+01	No	No	<Tier I	No
CBS-CSE	7439-98-7	Molybdenum	mg/kg	2 : 17 : 17	3.84E-01	1.50E+00	No	8.90E-01	Yes	No	3.90E+02	No	No	<Tier I	No
CBS-CSE	7440-02-0	Nickel	mg/kg	17 : 17 : 17	1.81E+02	6.00E+02	No	4.28E+01	Yes	No	1.60E+03	No	No	<Tier I	No
CBS-CSE	87-86-5	Pentachlorophenol	mg/kg	7 : 17 : 17	1.13E-02	3.30E-02	No	7.52E-01	No	Yes	3.00E+00	No	No	<Tier I	No
CBS-CSE	85-01-8	Phenanthrene	mg/kg	4 : 17 : 17	1.26E-01	2.90E-01	No	ND	--	No	2.30E+04	No	No	<Tier I	No
CBS-CSE	7440-09-7	Potassium	mg/kg	17 : 17 : 17	2.07E+03	2.90E+03	Yes	4.20E+03	No	Yes	NA	No	No	EN	--
CBS-CSE	129-00-0	Pyrene	mg/kg	3 : 17 : 17	1.48E-01	4.80E-01	No	ND	--	No	2.30E+03	No	No	<Tier I	No
CBS-CSE	7440-22-4	Silver	mg/kg	3 : 17 : 17	1.20E+00	9.80E+00	No	ND	--	No	3.90E+02	No	No	<Tier I	No

TABLE E-1
SELECTION OF CONSTITUENTS OF POTENTIAL CONCERN
SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
HUMAN HEALTH RISK ASSESSMENT

Area	CAS #	Constituent	Units	Frequency of Detection	Average Concentration (Avg)	Maximum Detected Concentration (Max)	Essential Nutrient (EN)?	Sediment Background (BK) Concentration	Is Max>BK?	Pass EN/BK?	Taco Tier I Residential Direct Contact (DC) Concentration	Is Max>DC?	COPC?	Reason	Is Avg>100x DC?
CBS-CSE	7440-23-5	Sodium	mg/kg	17 : 17 : 17	2.41E+02	3.90E+02	Yes	ND	--	Yes	NA	No	No	EN	--
CBS-CSE	7440-28-0	Thallium	mg/kg	1 : 16 : 17	6.61E-01	8.80E-01	No	ND	--	No	6.30E+00	No	No	<Tier I	No
CBS-CSE	7440-31-5	Tin	mg/kg	3 : 17 : 17	5.60E+00	3.10E+01	No	ND	--	No	4.70E+04	No	No	<Tier I	No
CBS-CSE	108-88-3	Toluene	mg/kg	3 : 17 : 17	3.70E-03	4.45E-03	No	ND	--	No	6.50E+02	No	No	<Tier I	No
CBS-CSE	1336-36-3	Total PCBs	mg/kg	10 : 17 : 17	1.87E-01	1.25E+00	No	ND	--	No	1.00E+00	Yes	Yes	>Tier I	No
CBS-CSE	7440-62-2	Vanadium	mg/kg	17 : 17 : 17	2.95E+01	3.90E+01	No	6.98E+01	No	Yes	5.50E+02	No	No	<Tier I	No
CBS-CSE	7440-66-6	Zinc	mg/kg	17 : 17 : 17	1.92E+03	5.90E+03	No	1.66E+02	Yes	No	2.30E+04	No	No	<Tier I	No
CBS-CSF	79-34-5	1,1,2,2-Tetrachloroethane	mg/kg	1 : 16 : 16	3.91E-03	1.00E-02	No	ND	--	No	3.80E-01	No	No	<Tier I	No
CBS-CSF	79-00-5	1,1,2-Trichloroethane	mg/kg	1 : 16 : 16	3.67E-03	6.10E-03	No	ND	--	No	3.10E+02	No	No	<Tier I	No
CBS-CSF	107-06-2	1,2-Dichloroethane	mg/kg	1 : 1 : 16	2.10E-03	2.10E-03	No	ND	--	No	4.00E-01	No	No	<Tier I	No
CBS-CSF	106-46-7	1,4-Dichlorobenzene	mg/kg	1 : 1 : 16	9.40E-02	9.40E-02	No	ND	--	No	3.40E+00	No	No	<Tier I	No
CBS-CSF	1746-01-6	2,3,7,8-TCDD-TEQ	mg/kg	16 : 16 : 16	8.91E-05	7.69E-04	No	1.24E-05	Yes	No	1.00E-03	No	No	<Tier I	No
CBS-CSF	94-75-7	2,4-D	mg/kg	3 : 16 : 16	7.00E-03	2.63E-02	No	2.03E-02	Yes	No	7.80E+02	No	No	<Tier I	No
CBS-CSF	78-93-3	2-Butanone (MEK)	mg/kg	7 : 8 : 16	1.03E-02	1.40E-02	No	4.99E-02	No	Yes	7.30E+03	No	No	<Tier I	No
CBS-CSF	72-55-9	4,4'-DDE	mg/kg	4 : 4 : 15	1.01E-03	1.60E-03	No	ND	--	No	2.00E+00	No	No	<Tier I	No
CBS-CSF	50-29-3	4,4'-DDT	mg/kg	3 : 15 : 15	3.42E-03	7.50E-03	No	ND	--	No	2.00E+00	No	No	<Tier I	No
CBS-CSF	67-64-1	Acetone	mg/kg	7 : 16 : 16	4.22E-02	6.40E-02	No	1.56E-01	No	Yes	7.80E+03	No	No	<Tier I	No
CBS-CSF	309-00-2	Aldrin	mg/kg	1 : 1 : 16	2.30E-04	2.30E-04	No	ND	--	No	4.00E-02	No	No	<Tier I	No
CBS-CSF	5103-71-9	alpha-Chlordane	mg/kg	2 : 15 : 16	1.97E-03	4.10E-03	No	ND	--	No	5.00E-01	No	No	<Tier I	No
CBS-CSF	7429-90-5	Aluminum	mg/kg	16 : 16 : 16	8.86E+03	1.20E+04	No	2.90E+04	No	Yes	7.60E+04	No	No	<Tier I	No
CBS-CSF	7440-36-0	Antimony	mg/kg	2 : 3 : 16	6.27E-01	6.60E-01	No	2.75E+00	No	Yes	3.10E+01	No	No	<Tier I	No
CBS-CSF	7440-38-2	Arsenic	mg/kg	15 : 16 : 16	9.71E+00	1.90E+01	No	1.44E+01	Yes	No	4.00E-01	Yes	Yes	>Tier I	No
CBS-CSF	7440-39-3	Barium	mg/kg	16 : 16 : 16	2.19E+02	3.30E+02	No	4.13E+02	No	Yes	5.50E+03	No	No	<Tier I	No
CBS-CSF	56-55-3	Benz(a)anthracene	mg/kg	4 : 4 : 16	6.23E-02	9.20E-02	No	ND	--	No	9.00E-01	No	No	<Tier I	No
CBS-CSF	50-32-8	Benz(a)pyrene	mg/kg	5 : 16 : 16	6.95E-02	1.90E-01	No	ND	--	No	9.00E-02	Yes	Yes	>Tier I	No
CBS-CSF	205-99-2	Benz(b)fluoranthene	mg/kg	5 : 16 : 16	1.14E-01	1.80E-01	No	ND	--	No	9.00E-01	No	No	<Tier I	No
CBS-CSF	191-24-2	Benzo(g,h,i)perylene	mg/kg	5 : 15 : 16	1.07E-01	1.30E-01	No	ND	--	No	2.30E+03	No	No	<Tier I	No
CBS-CSF	207-08-9	Benzo(k)fluoranthene	mg/kg	4 : 15 : 16	1.10E-01	1.30E-01	No	ND	--	No	9.00E+00	No	No	<Tier I	No
CBS-CSF	7440-41-7	Beryllium	mg/kg	13 : 16 : 16	6.10E-01	8.90E-01	No	1.56E+00	No	Yes	1.56E+02	No	No	<Tier I	No
CBS-CSF	319-85-7	beta-BHC	mg/kg	1 : 16 : 16	8.21E-04	3.90E-03	No	ND	--	No	1.00E-01	No	No	<Tier I	No
CBS-CSF	117-81-7	Bis(2-ethylhexyl)phthalate	mg/kg	4 : 6 : 16	9.06E-02	1.10E-01	No	ND	--	No	4.60E+01	No	No	<Tier I	No
CBS-CSF	75-27-4	Bromodichloromethane	mg/kg	1 : 1 : 16	1.30E-03	1.30E-03	No	ND	--	No	1.00E+01	No	No	<Tier I	No
CBS-CSF	75-25-2	Bromoform	mg/kg	1 : 2 : 16	2.95E-03	3.00E-03	No	ND	--	No	5.30E+01	No	No	<Tier I	No
CBS-CSF	7440-43-9	Cadmium	mg/kg	15 : 16 : 16	2.03E+01	5.70E+01	No	8.30E-01	Yes	No	7.80E+01	No	No	<Tier I	No
CBS-CSF	7440-70-2	Calcium	mg/kg	16 : 16 : 16	9.80E+03	1.70E+04	Yes	2.70E+04	No	Yes	NA	No	No	EN	--
CBS-CSF	108-90-7	Chlorobenzene	mg/kg	3 : 16 : 16	4.41E-03	1.40E-02	No	ND	--	No	1.30E+02	No	No	<Tier I	No
CBS-CSF	7440-47-3	Chromium	mg/kg	16 : 16 : 16	1.68E+01	2.90E+01	No	4.00E+01	No	Yes	2.70E+02	No	No	<Tier I	No
CBS-CSF	218-01-9	Chrysene	mg/kg	5 : 16 : 16	1.08E-01	1.40E-01	No	ND	--	No	8.80E+01	No	No	<Tier I	No
CBS-CSF	7440-48-4	Cobalt	mg/kg	16 : 16 : 16	8.84E+00	1.30E+01	No	1.72E+01	No	Yes	4.70E+03	No	No	<Tier I	No
CBS-CSF	7440-50-8	Copper	mg/kg	16 : 16 : 16	1.20E+02	5.05E+02	No	3.80E+01	Yes	No	2.90E+03	No	No	<Tier I	No
CBS-CSF	57-12-5	Cyanide	mg/kg	2 : 16 : 16	6.56E-01	4.57E+00	No	ND	--	No	1.60E+03	No	No	<Tier I	No
CBS-CSF	124-48-1	Dibromochloromethane	mg/kg	1 : 1 : 16	2.00E-03	2.00E-03	No	ND	--	No	1.30E+03	No	No	<Tier I	No
CBS-CSF	1918-00-9	Dicamba	mg/kg	4 : 4 : 16	4.09E-03	6.25E-03	No	ND	--	No	1.80E+03	No	No	<Tier I	No

TABLE E-1
SELECTION OF CONSTITUENTS OF POTENTIAL CONCERN
SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
HUMAN HEALTH RISK ASSESSMENT

Area	CAS #	Constituent	Units	Frequency of Detection	Average Concentration (Avg)	Maximum Detected Concentration (Max)	Essential Nutrient (EN)?	Sediment Background (BK) Concentration	Is Max>BK?	Pass EN/BK?	Taco Tier I Residential Direct Contact (DC) Concentration	Is Max>DC?	COPC?	Reason	Is Avg>100x DC?
CBS-CSF	60-57-1	Dieldrin	mg/kg	9 : 16 : 16	2.30E-03	8.20E-03	No	ND	--	No	4.00E-02	No	No	<Tier I	No
CBS-CSF	1031-07-8	Endosulfan sulfate	mg/kg	1 : 10 : 16	2.73E-03	4.30E-03	No	ND	--	No	4.70E+02	No	No	<Tier I	No
CBS-CSF	206-44-0	Fluoranthene	mg/kg	5 : 16 : 16	1.12E-01	1.70E-01	No	ND	--	No	3.10E+03	No	No	<Tier I	No
CBS-CSF	5103-74-2	gamma-Chlordane	mg/kg	6 : 16 : 16	1.52E-03	3.80E-03	No	ND	--	No	5.00E-01	No	No	<Tier I	No
CBS-CSF	87-68-3	Hexachlorobutadiene	mg/kg	1 : 1 : 16	6.10E-02	6.10E-02	No	ND	--	No	6.20E+00	No	No	<Tier I	No
CBS-CSF	193-39-5	Indeno(1,2,3-cd)pyrene	mg/kg	2 : 5 : 16	1.06E-01	1.10E-01	No	ND	--	No	9.00E-01	No	No	<Tier I	No
CBS-CSF	7439-89-6	Iron	mg/kg	16 : 16 : 16	1.93E+04	4.10E+04	Yes	4.13E+04	No	Yes	NA	No	No	EN	--
CBS-CSF	7439-92-1	Lead	mg/kg	16 : 16 : 16	5.81E+01	4.50E+02	No	4.38E+01	Yes	No	4.00E+02	No	No	Aug <Tier 1 (a)	No
CBS-CSF	7439-95-4	Magnesium	mg/kg	16 : 16 : 16	5.27E+03	8.20E+03	Yes	1.03E+04	No	Yes	NA	No	No	EN	--
CBS-CSF	7439-96-5	Manganese	mg/kg	16 : 16 : 16	3.35E+02	8.90E+02	No	1.42E+03	No	Yes	3.70E+03	No	No	<Tier I	No
CBS-CSF	7085-19-0	MCPP	mg/kg	1 : 16 : 16	1.46E+00	2.30E+00	No	ND	--	No	6.10E+01	No	No	<Tier I	No
CBS-CSF	7439-97-6	Mercury	mg/kg	16 : 16 : 16	1.91E-01	8.20E-01	No	9.60E-02	Yes	No	1.00E+01	No	No	<Tier I	No
CBS-CSF	75-09-2	Methylene chloride	mg/kg	4 : 15 : 16	3.26E-03	4.30E-03	No	ND	--	No	1.30E+01	No	No	<Tier I	No
CBS-CSF	7439-98-7	Molybdenum	mg/kg	2 : 16 : 16	5.90E-01	2.20E+00	No	8.90E-01	Yes	No	3.90E+02	No	No	<Tier I	No
CBS-CSF	7440-02-0	Nickel	mg/kg	16 : 16 : 16	1.67E+02	6.30E+02	No	4.28E+01	Yes	No	1.60E+03	No	No	<Tier I	No
CBS-CSF	87-86-5	Pentachlorophenol	mg/kg	8 : 16 : 16	9.11E-03	2.40E-02	No	7.52E-01	No	Yes	3.00E+00	No	No	<Tier I	No
CBS-CSF	85-01-8	Phenanthrene	mg/kg	4 : 4 : 16	5.93E-02	9.80E-02	No	ND	--	No	2.30E+04	No	No	<Tier I	No
CBS-CSF	7440-09-7	Potassium	mg/kg	16 : 16 : 16	1.59E+03	2.30E+03	Yes	4.20E+03	No	Yes	NA	No	No	EN	--
CBS-CSF	129-00-0	Pyrene	mg/kg	2 : 16 : 16	1.21E-01	1.60E-01	No	ND	--	No	2.30E+03	No	No	<Tier I	No
CBS-CSF	7782-49-2	Selenium	mg/kg	1 : 15 : 16	6.89E-01	1.80E+00	No	ND	--	No	3.90E+02	No	No	<Tier I	No
CBS-CSF	7440-22-4	Silver	mg/kg	1 : 16 : 16	6.65E-01	7.90E-01	No	ND	--	No	3.90E+02	No	No	<Tier I	No
CBS-CSF	7440-23-5	Sodium	mg/kg	15 : 16 : 16	1.38E+02	2.90E+02	Yes	ND	--	Yes	NA	No	No	EN	--
CBS-CSF	7440-31-5	Tin	mg/kg	1 : 16 : 16	3.77E+00	1.70E+01	No	ND	--	No	4.70E+04	No	No	<Tier I	No
CBS-CSF	108-88-3	Toluene	mg/kg	8 : 16 : 16	4.31E-03	7.70E-03	No	ND	--	No	6.50E+02	No	No	<Tier I	No
CBS-CSF	1336-36-3	Total PCBs	mg/kg	7 : 16 : 16	6.75E-02	3.57E-01	No	ND	--	No	1.00E+00	No	No	<Tier I	No
CBS-CSF	7440-62-2	Vanadium	mg/kg	16 : 16 : 16	2.57E+01	3.40E+01	No	6.98E+01	No	Yes	5.50E+02	No	No	<Tier I	No
CBS-CSF	1330-20-7	Xylenes (total)	mg/kg	1 : 15 : 16	3.39E-03	4.05E-03	No	ND	--	No	4.10E+02	No	No	<Tier I	No
CBS-CSF	7440-66-6	Zinc	mg/kg	16 : 16 : 16	2.24E+03	1.50E+04	No	1.66E+02	Yes	No	2.30E+04	No	No	<Tier I	No

Attachment F

Oral Absorption Adjustment Factors (AAFs)

AAFS FOR ARSENIC

Absorption in the Dose-Response Study

Both oral toxicity values for arsenic are based on epidemiological studies that characterized health effects in a large population of Taiwanese who consumed drinking water containing arsenic. The exact form of the ingested arsenic is unknown. For the purposes of the development of the AAFs, it has been assumed that the arsenic was a soluble inorganic arsenic salt (such as arsenic trioxide, As₂O₃, a smelting by-product). Several studies investigating the absorption of arsenic have been performed in humans and various animal species. Human studies are sufficiently extensive to strongly suggest that close to 100% of soluble inorganic arsenic in water is absorbed from the gastrointestinal tract. These human studies are reviewed in detail here.

One direct indication of absorption of an orally administered dose of a chemical is its urinary excretion. Several studies show that urinary excretion can account for the majority of an orally administered dose of arsenic. Buchet et al. (1981a) administered aqueous sodium arsenite (NaAsO₂) as a single dose to three human volunteers. An average of 45% of the dose was excreted in the urine in four days. In a second study (Buchet et al., 1981b), four individuals given 125, 250, 500, or 1000 µg As/day orally for five days excreted 54, 73, 74, and 64% of the dose in urine, respectively, over 14 days. The average urinary excretion of arsenic for the four subjects was 66% of the administered dose. Crecelius (1977) reports that approximately 50% and 80% of orally administered aqueous arsenic was excreted in urine within 61 hours by a single individual in two experiments. The results of these studies represent the minimum amount of arsenic absorbed since the balance of the dose was not accounted for.

Data for human fecal excretion of arsenic do exist. Pomroy et al. (1980) gave 6 male subjects radiolabelled arsenic acid ([⁷⁴As]H₃AsO₄) in gelatin capsules followed by a glass of water. The presence of arsenic in the body, urine, and feces was measured using a whole body radiation counter. The authors report that for the six subjects the average total excretion over 7 days was 6.1±2.8% in feces. It is not possible to determine how much of this arsenic was first absorbed and then excreted. The total recovery of arsenic (urine plus feces) was 68.4±4.0% of the single oral dose. The remaining arsenic was reported to be present in the body tissues; virtually the entire dose could be accounted for. This suggests a minimum absorption of 94% (100% - 6%) of orally ingested arsenic.

A study by Bettley and O'Shea (1975) also reports excretion of arsenic in both urine and feces. Three subjects were exposed to 8.52 mg As (as 1.25 ml of Liq. Arsenicalis B.P.) in three portions 8 hours apart on one day. They found that at most 3.5% of the dose was excreted in feces over ten days. This suggests a minimum absorption of 96%. Urinary excretion averaged 52±4% of the exposure dose over 10 days (n=3). The remaining half of the dose was unaccounted for, although small amounts of arsenic were found in blood and hair.

In the Coulson study (Coulson et al., 1935), results from two humans each ingesting two forms of arsenic are reported. Less than 5% of an oral dose was excreted in feces whether the arsenic was taken as arsenic trioxide (As₂O₃) or as natural arsenic present in shrimp. The remainder of the dose, more than 95%, was recovered in urine in three experiments where total recoveries ranged from 74 to 115%. Based on the fecal excretion data from this study, it can be estimated that at least 95% of the ingested arsenic was absorbed. The fecal excretion data are consistent with those of Pomroy et al. (1980) and Bettley and O'Shea (1975).

Fecal excretion data from oral studies provide a minimum estimate of absorption, because it cannot be determined how much of the dose was first absorbed and then excreted into the feces. However, a study in humans injected intravenously with arsenic suggests that absorbed arsenic may be excreted, presumably from bile, into the feces. Mealy et al. (1959) administered radiolabelled arsenic by intravenous injection. Between 57% and 90% of the injected dose was recovered in urine in 10 days. Fecal excretion accounted for 1.3% of

the dose after seventeen days in one individual. A second subject excreted 0.2% of the intravenous dose into the feces in one week. Both results indicate some excretion of arsenic into the feces. Virtually all of the remaining dose was recovered in the urine. Biliary excretion of arsenic has been demonstrated in rats, rabbits, and dogs (Klaassen, 1974; Gregus and Klaassen, 1986). This indicates that a portion of the arsenic found in feces in studies using oral dosing may have been first absorbed and then excreted.

The urinary excretion data from the oral studies discussed above provide minimum estimates of arsenic absorption ranging from 45% to 95%. The fecal excretion data suggest that, at a minimum, 95-96% of an orally administered dose of arsenic is absorbed. The study of intravenously administered arsenic suggest that biliary excretion can occur. Therefore, it can conservatively be concluded from the above studies that virtually 100% of an orally administered dose of soluble inorganic arsenic can be absorbed in humans.

Oral-Soil AAF

The oral-soil AAF for arsenic is defined as: (absorption of arsenic in humans from ingested soil) / (absorption of arsenic in humans in the epidemiological study from ingested water).

An oral-soil AAF of 0.3 is recommended for arsenic in soil and dust in cases where site-specific information is not available. The 0.3 value is based on the high end of relative bioavailability estimates for arsenic ingested in soil and dust by *Cynomolgus* monkeys (Freeman et al., 1995).

The study was conducted to determine arsenic absorption from soil and house dust impacted by smelter activities near Anaconda, Montana. The *Cynomolgus* monkeys each received sequential treatments of iv sodium arsenite and three oral treatments: soil arsenic in capsules, house dust arsenic in capsules, and sodium arsenite solution administered by gavage. Absolute bioavailability values for arsenic administered in soil, dust, and solution were calculated based on (1) total urinary arsenic excretion and (2) blood arsenic levels, each normalized based on intravenous data. The bioavailability of arsenic in soil and dust relative to soluble arsenic in solution ranged from 10% to 30%, depending on whether urinary or blood values were used. Results from this study were used by USEPA to derive the oral-soil AAF of 0.183 and oral-dust AAF of 0.258 used in the risk assessment at the Anaconda Superfund site (Walker and Griffin, 1998).

Other Relevant Studies

Other studies of various forms of arsenic support the conclusion that arsenic in soil is poorly absorbed. At the Murray Smelter Superfund site in Utah, a site-specific relative bioavailability adjustment value for arsenic in soil of 0.26 was derived based on an immature swine study comparing absorption of arsenic in soil from the site to absorption of soluble sodium arsenite (Weis et al., 1996; USEPA, 1997). In a similar swine study performed at the Ruston/North Tacoma Superfund site in Washington, the site-specific relative bioavailability adjustment value for arsenic in slag dust was 0.42 (USEPA, 1996). Groen et al. (1994) fed ore-containing soil or administered soluble arsenic iv, sequentially to beagle dogs. When compared to iv administration, bioavailability of arsenic from ore-containing soil was approximately 8%. In rabbits, the absorption of arsenic (primarily as Cu₃AsS₄) in soil from a site in Anaconda, Montana was only 24%, while the absorption of a soluble form arsenic from water was 50% (Freeman et al., 1993). Rats fed soil containing mine waste absorbed only one tenth times as much arsenic as rats dosed with soluble arsenic (Yanez et al., 1993). Arsenic selenide, a highly insoluble form, was administered to humans as a fine powder and no increase in urinary arsenic was observed (Mappes, 1977). Thus, absorption in this study was probably low or negligible.

Derivation of the AAF (Oral-Soil) for Arsenic

An oral-soil AAF of 0.3 is recommended for arsenic in soil and dust in cases where site-specific information is not available. The 0.3 value is based on the high end of relative bioavailability estimates for arsenic ingested in soil and dust by *Cynomolgus* monkeys (Freeman et al., 1995). This study was selected to derive the oral-

soil AAF for arsenic because, of the animals models studied thus far, the monkey is more physiologically and anatomically similar to humans than are rats, rabbits, swine, or dogs.

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AAFS FOR POLYCYCLIC AROMATIC HYDROCARBONS (PAH)

The majority of the information presented below was derived from a paper entitled Absorption Adjustment Factor (AAF) Distributions for Polycyclic Aromatic Hydrocarbons (PAHs) (Magee et al., 1996).

Absorption in the Dose-Response Studies

In the studies used to develop the cancer slope factor for benzo(a)pyrene, benzo(a)pyrene was administered in the diet. The Magee et al. (1996) paper summarizes studies on the gastrointestinal absorption of PAHs, and develops a point estimate for gastrointestinal absorption in the dose-response studies of 92%, which is the average of 13 data points from six studies.

Oral-Soil AAF

An oral-soil AAF of 0.29 is used for benzo(a)anthracene, benzo(a)pyrene (BAP), benzo(b)fluoranthene, and dibenzo(a,h)anthracene. This value is based on a review of six available studies of PAHs performed in vivo, as summarized in Magee et al. (1996). Three studies that evaluated gastrointestinal (oral) absorption of PAHs from a soil matrix (Goon et al., 1991; Rozett et al., 1996; and Weyand et al., 1996) were deemed appropriate for use for developing an oral-soil AAF. The Rozett et al. (1996) study evaluated the bioavailability of pyrene from aged soil from manufactured gas plant residue (coal tar). The oral AAFs based on this study range from 0.07 to 0.76, with an average of 0.26. Weyand et al. (1996) also evaluated the oral bioavailability of pyrene from manufactured gas plant residue. The oral AAFs based on this study range from 0.11 to 0.36, with an average of 0.23. The last study, Goon et al. (1991) evaluated the bioavailability of BAP adsorbed to "aged" soil (clay-based and sand-based soils). These aged soils were treated with BAP and allowed to age 1 to 30 days, and 6 months to 1 year. The oral AAF for clay-based soil is 0.37 and that for sand-based soils is 0.57. A probabilistic (Monte Carlo) analysis, using 12 estimates of the AAF from all three studies, results in a 50th percentile oral-soil AAF of 0.27, with an upper 90th percentile value of 0.57. The Magee et al. (1996) paper recommends the use of a point-estimate oral-soil AAF of 0.29, which is the arithmetic mean of the point estimates used to develop the distribution.

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AAFS FOR POLYCHLORINATED BIPHENYLS (PCB)

The CSFs for PCBs range from 0.04 to 2.0 (mg/kg-day)⁻¹ and are based on the results from five chronic dietary studies in rats (Brunner et al., 1996; Kimbrough et al., 1975; NCI, 1978; Schaeffer et al., 1984; and Norback and Weltman, 1985).

The current oral RfDs for Aroclor 1016 and Aroclor 1254 are 7.0E-5 mg/kg-day and 2.0E-5 mg/kg-day, respectively. The Aroclor 1016 value is based on critical effects observed in a reproductive bioassay in monkeys that were fed Aroclor 1016 in their diet (Barsotti and van Miller, 1984; Levin et al., 1988; Schantz et al., 1989, 1991). The Aroclor 1254 value is based on monkey clinical and immunologic studies in which the animals were fed gelatin capsules containing Aroclor 1254 in a glycerol: corn oil vehicle (Arnold et al., 1993a,b; Tryphonas et al., 1989, 1991a,b).

Absorption in the Dose-Response Study

Because all of the studies are based on dietary exposures, the AAFs developed below apply to both carcinogenic and non-carcinogenic effects of PCBs. In all of the dose-response studies, various Aroclors were administered in the diet. However, no information on the efficiency of gastrointestinal absorption in those studies was presented. The studies summarized below have been used in the development of AAFs for PCBs. The specific absorption values used in the calculation of the average absorption value are indicated by underlining below.

1. Allen et al. (1975) gave single oral doses of 2,5,2',5'-tetrachlorobiphenyl (18 mg/kg bw) to four adult rhesus monkeys by gastric intubation. PCBs were given in 2.5 ml of corn oil on an empty stomach. Unmetabolized PCBs were analyzed in the feces by gas chromatography (GC). Minimum gastrointestinal absorption was found to be 88%. PCBs found in the feces over specified post-dosing times were presumed to be unabsorbed material. Because PCB metabolites are known to be eliminated in the bile, the possibility exists that some of the PCBs present in the feces were absorbed and then eliminated. As such, only minimum absorption efficiencies can be determined from this and similar studies.
2. Allen et al. (1974) gave single oral doses of PCBs (Aroclor 1248) (1.5 or 3.0 g/kg bw) to two adult rhesus monkeys by gastric intubation. The vehicle was not specified but is presumed to be corn oil. Dosing was done on an empty stomach. Unmetabolized PCBs were analyzed for in feces by GC. Recovery was reported to be high. Minimum gastrointestinal absorption was reported to be 94%.
3. Albro and Fishbein (1972) gave single oral doses of 20 different PCB congeners (5-100 mg/kg bw) and the unabsorbed marker compound, squalene, to CD rats. The mixture was given by stomach tube to unfasted animals who were allowed food and water ad libitum. No vehicle was specified. Although this was not a diet study, per se, it is possible that dietary components were present in the stomach at the same time as were the test compounds. Minimum gastrointestinal absorption was reported to be 90% for all congeners.
4. Tanabe et al. (1981) gave repeated oral doses of Kanechlores (300, 400, 500, 600) (c.30 mg/kg bw/day x 5 days) to Wistar rats. The dose was given in corn oil. Commercial diet was given ad libitum. No information on the animals' stomach contents was reported. Parent compounds were analyzed in the

feces by GC/MS (mass spectrometry). Minimal gastrointestinal absorption was reported to be 85% for total PCB. Cl₅ to Cl₇ congeners had 75-90% absorption.

5. Berlin et al. (1975) gave a single oral dose of 2,4,5,2',5'-pentachlorobiphenyl (7 mg/kg bw) to three CBA mice. The PCBs were given as an aqueous emulsion. No information on the animal's stomach contents was given. Minimal gastrointestinal absorption was reported to be 93%.
6. Van Miller et al. (1975) gave single oral doses (50 mg) of tritiated 2,2',5,5'-tetrachlorobiphenyl to three male Sprague-Dawley rats. The PCB was given by gavage in corn oil. Animals were given food and water ad libitum for 14 days. Urine, feces, and various tissues were analyzed. Over 86% of the radioactivity was present in the excreta as metabolites at 14 days. Thus, minimum gastrointestinal absorption was 86%.
7. Fries et al. (1989) gave four groups of four male Sprague-Dawley rats radiolabeled 2,2',5,5'-tetrachlorobiphenyl in diet or in corn oil (by gavage) or 2,2',4,5,5'-pentachlorobiphenyl in diet or in corn oil (by gavage). The animals given the PCBs by gavage were fed unspiked diet ad libitum. PCBs were administered daily for five days. Rats were then fed unspiked diet for 10 days. Urine and feces were collected. At 15 days, animals were sacrificed, and samples of fat and liver tissue were taken for analysis. The dose of PCBs given was not reported. The amount absorbed was defined as the amount that did not appear in the feces as parent compound. The average absorption of the two congeners when given in a dietary matrix was 89% [(91% + 86%) / 2]. The average absorption of the two congeners when given by corn oil gavage was 88% [(95% + 81%) / 2].

The above seven studies, which involve both rodents and primates and various PCB mixtures and purified congeners, all show that PCBs are very effectively absorbed from the gastrointestinal tract. In the one study (Fries, et al., 1989) in which PCBs were administered by diet, the absorption was shown to be 89%. The other six studies involved the administration of PCBs in various vehicles by gavage. These studies are also relevant to the estimation of the absorption seen in the dose-response studies, because Fries et al. (1989) showed in their rat study that there was no difference in absorption between diet and corn oil gavage. Accordingly, the results from all seven studies were averaged to yield an estimate of 89% for the absorption in the dose-response study.

Oral-Soil AAF

Fries et al. (1989) gave four groups of four male Sprague-Dawley rats radiolabeled 2,2',5,5'-tetrachlorobiphenyl in diet or in soil or 2,2',4,5,5'-pentachlorobiphenyl in diet or soil. ¹⁴C-PCB soil was added to a standard rat diet in meal form at the rate of 5%. In the control experiment, ¹⁴C-PCB in acetone was added to the feed. The PCB-soil was a Galestown sandy loam with a pH of 6.7 and which contained 67% sand, 22% silt, 11% clay, and 5% organic matter. Soils had been spilled with PCBs 8 years earlier and were stored at -5° C. At the time of the experiment, fractions passing through a 125 µm sieve were spiked with ¹⁴C-PCB for quantitation.

PCBs were administered daily for five days. Rats were then fed unspiked diet for 10 days. Urine and feces were collected. At 15 days, animals were sacrificed, and samples of fat and liver tissue were taken for analysis. The dose of PCB was not reported. The amount absorbed was defined as the amount that did not appear in the feces as parent compound.

The ratio of the amount of PCB absorbed when present as a soil matrix to that absorbed when present as a component of diet is a direct estimate of the oral-soil AAF. From this experiment, AAF estimates are available

for two PCB congeners. The oral-soil AAF for the tetrachlorobiphenyl is (80%)/(91%)=0.88, while the estimate for the pentachlorobiphenyl congener is (67%)/(86%)=0.78. These two estimates are averaged [(0.88+0.78)/2] to give an estimate of the AAF (oral-soil) for PCB mixtures of 0.83.

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AAFs for 2,3,7,8-TCDD TEQ

The oral CSF for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) of $1.5E+05$ (mg/kg-day)⁻¹ is based on a dietary study in rats (Kociba et al., 1978). The diet was prepared by mixing (30 minutes) an acetone solution of TCDD with laboratory chow. The acetone was evaporated yielding a TCDD/diet mixture. TCDD concentration was 0.02 - 2 ppb (0.001 - 0.1 µg/kg-day). No absorption information is given in the Kociba et al. (1978) study.

Absorption in the Dose-Response Study

USEPA has summarized selected information on gastrointestinal absorption of 2,3,7,8-TCDD and related compounds in laboratory animals after a single oral exposure by gavage (USEPA, 2000). Doses ranged between 0.5 and 5000 ug/kg. This range is above the dose range used in the Kociba et al. (1978) study. The administered dose absorbed ranged from 2-90%. The single human study presented estimated 87% absorption from a 0.001 ug/kg 2,3,7,8-TCDD dose administered in corn oil. The average absorption estimated from the six reported studies of chlorinated dibenzodioxins (CDDs) administered at doses less than or equal to 50 ug/kg is 62%. USEPA (2000) notes that "gastrointestinal absorption of TCDD and related compounds is variable, incomplete, and congener- and vehicle-specific."

In a study by Fries and Marrow (1975), however, rats were given TCDD in their diet continuously for 42 days. The total observation period of the experiment was 70 days. Diets were prepared in a similar manner to that used by Kociba et al. (1978). Laboratory chow was mixed with a benzene solution of TCDD and the benzene was evaporated. Two dose levels were used, 7 ppb and 20 ppb, slightly above the dose level used in the Kociba et al. (1978) study. Absorption was reported to be 50-60%.

As the Fries and Marrow (1975) study directly measured absorption from the diet, and the study upon which the CSF for TCDD is based is a dietary study, the Fries and Marrow (1975) data will be used in the AAF determination. For the purposes of AAF derivation, 55% was used as the absorption efficiency in the dose-response study. This absorption estimate is consistent with the estimates of absorption for the single oral gavage studies.

AAF (Oral-Soil)

Data for the bioavailability of TCDD from soil have been summarized by the USEPA (2000). Studies indicate that intestinal absorption of TCDD from soil is approximately half that reported for TCDD administered in corn oil to guinea pigs and rats (McConnel, et al., 1984 and Lucier, et al., 1986; as reported in USEPA 2000). Estimates of bioavailability of TCDD in site soils (i.e., not laboratory prepared soils) range from 0.5% to 43%. Assuming that absorption of TCDD from the diet (as prepared by Kociba et al., 1978) is similar to that from corn oil (i.e., 55% of TCDD in diet or corn oil would be absorbed following oral exposure) it can be inferred that approximately 27.5 % of TCDD in soil may be absorbed following oral exposure. As this absorption estimate more directly compares absorption of TCDD from soil to dietary exposures, it is used here for AAF derivation. Therefore, in this risk assessment, the AAF (oral-soil) is $(27.5\%)/(55\%) = 0.5$.

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Attachment G

Risk Calculation Spreadsheets

SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS

MLE

Receptors Evaluated

Receptor 1:

MLE Recreational Teen

**ASSUMPTIONS FOR RECREATIONAL TEEN - MLE
INCIDENTAL INGESTION AND DERMAL CONTACT CREEK BOTTOM SOILS**

		Assumed Value	Units	Calculated Value
Soil Ingestion Rate	MLE Recreational Teen	50	(mg soil/day)	
Adherence Factor	MLE Recreational Teen	0.04	(mg/cm ²)	
Skin Exposed	MLE Recreational Teen	3259	(cm ²)	
Body Weight	MLE Recreational Teen	47	(kg)	
Exposure Frequency	MLE Recreational Teen	13	(days)/365(days) =	3.56E-02
Exposure Duration (cancer)	MLE Recreational Teen	11	(years)/70(years) =	1.57E-01
Exposure Duration (noncancer)	MLE Recreational Teen	11	(yrs)/11(yrs) =	1.00E+00
Lifetime		70	(years)	
Unit Conversion Factor		1.00E-06	(kg/mg)	

SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS

MLE

POTENTIAL CARCINOGENIC RISK

INCIDENTAL INGESTION AND DERMAL CONTACT

CREEK BOTTOM SOILS

RECREATIONAL TEEN - MLE

Constituent	Unit in Soil (mg/kg)	Oral - Soil Absorption Factor	Dermal - Soil Absorption Factor	Oral Cancer Slope Factor (mg/kg-day) ^a	Lifetime Average Daily Dose-Ing. (mg/kg-day)	Lifetime Average Daily Dose-Der. (mg/kg-day)	Lifetime Excess Lifetime Cancer Risk - Ingestion	Lifetime Excess Lifetime Cancer Risk - Dermal Contact	Unit Cancer Risk
1,4-Dichlorobenzene	1.00E+00	1	0.1	1.30E-02	5.95E-09	1.55E-09	7.74E-11	2.02E-11	9.76E-11
4-Nitroaniline	1.00E+00	1	0.1	2.10E-02	5.95E-09	1.55E-09	1.25E-10	3.26E-11	1.58E-10
Arsenic	1.00E+00	0.3	0.03	1.50E+00	1.79E-09	4.66E-10	2.68E-09	6.99E-10	3.38E-09
Benzo(a)anthracene	1.00E+00	0.29	0.13	7.30E-01	1.73E-09	2.02E-09	1.26E-09	1.47E-09	2.73E-09
Benzo(a)pyrene	1.00E+00	0.29	0.13	7.30E+00	1.73E-09	2.02E-09	1.26E-08	1.47E-08	2.73E-08
Benzo(b)fluoranthene	1.00E+00	0.29	0.13	7.30E-01	1.73E-09	2.02E-09	1.26E-09	1.47E-09	2.73E-09
Bis(2-ethylhexyl)phthalate	1.00E+00	1	0.1	1.40E-02	5.95E-09	1.55E-09	8.34E-11	2.17E-11	1.05E-10
Copper	1.00E+00	1	1	NA	5.95E-09	1.55E-08	NA	NA	NC
Dibenzo(a,h)anthracene	1.00E+00	0.29	0.13	7.30E+00	1.73E-09	2.02E-09	1.26E-08	1.47E-08	2.73E-08
Dieldrin	1.00E+00	1	0.1	1.60E+01	5.95E-09	1.55E-09	9.53E-08	2.48E-08	1.20E-07
Heptachlor	1.00E+00	1	0.1	4.50E+00	5.95E-09	1.55E-09	2.68E-08	6.99E-09	3.38E-08
Heptachlor epoxide	1.00E+00	1	0.1	9.10E+00	5.95E-09	1.55E-09	5.42E-08	1.41E-08	6.83E-08
Pentachlorophenol	1.00E+00	1	0.25	1.20E-01	5.95E-09	3.88E-09	7.14E-10	4.66E-10	1.18E-09
2,3,7,8-TCDD TEQ	1.00E+00	0.5	0.03	1.50E+05	2.98E-09	4.66E-10	4.47E-04	6.99E-05	5.16E-04
Total PCBs	1.00E+00	0.83	0.14	2.00E+00	4.94E-09	2.17E-09	9.88E-09	4.35E-09	1.42E-08

Carcinogenic Assessment - Scaling Table
 Risk by Dermal Contact with and Ingestion of Creek Bottom Soils
 MLE Recreational Teen
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Compound	Reference Risk (per mg/kg) (a)	Creek Segment B		Creek Segment D		Creek Segment E		Creek Segment F		SITE M	
		EPC (mg/kg)	Risk	EPC (mg/kg)	Risk						
1,4-Dichlorobenzene	9.76E-11	0.29	2.83E-11	--	NC	--	NC	--	NC	0.98	9.56E-11
4-Nitroaniline	1.58E-10	0.76	1.20E-10	--	NC	--	NC	--	NC	--	NC
Arsenic	3.38E-09	9.72	3.28E-08	11.40	3.85E-08	8.08	2.73E-08	9.71	3.28E-08	7.28	2.46E-08
Benzo(a)anthracene	2.73E-09	0.17	4.65E-10	--	NC	--	NC	--	NC	--	NC
Benzo(a)pyrene	2.73E-08	0.11	3.01E-09	0.08	2.19E-09	0.09	2.46E-09	0.07	1.90E-09	0.21	5.74E-09
Benzo(b)fluoranthene	2.73E-09	0.16	4.37E-10	--	NC	--	NC	--	NC	--	NC
Bis(2-ethylhexyl)phthalate	1.05E-10	1.77	1.86E-10	--	NC	--	NC	--	NC	--	NC
Copper	NC	484.20	NC	--	NC	425.21	NC	--	NC	1437.78	NC
Dibenzo(a,h)anthracene	2.73E-08	0.07	1.91E-09	--	NC	0.07	1.91E-09	--	NC	0.08	2.19E-09
Dieldrin	1.20E-07	0.008	9.61E-10	0.13	1.56E-08	--	NC	--	NC	--	NC
Heptachlor	3.38E-08	--	NC	--	NC	--	NC	--	NC	0.03	1.01E-09
Heptachlor epoxide	6.83E-08	0.01	6.83E-10	--	NC	--	NC	--	NC	0.11	7.51E-09
Pentachlorophenol	1.18E-09	0.99	1.17E-09	--	NC	--	NC	--	NC	--	NC
2,3,7,8-TCDD TEQ	5.16E-04	0.00030	1.55E-07	--	NC	--	NC	--	NC	0.00096	4.96E-07
Total PCBs	1.42E-08	2.78	3.96E-08	0.49	6.97E-09	0.19	2.70E-09	--	NC	5.40	7.68E-08
TOTAL			2.36E-07		6.33E-08		3.44E-08		3.47E-08		6.14E-07

Notes:

EPC - Exposure Point Concentration.

NC - Not Calculated.

-- - Not a Compound of Potential Concern in this medium.

(a) - Reference risk is multiplied by the EPC in each area to obtain the potential risk.

SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS

MLE

NONCARCINOGENIC HAZARD INDEX

INCIDENTAL INGESTION AND DERMAL CONTACT

CREEK BOTTOM SOILS

RECREATIONAL TEEN - MLE

Constituent	Unit Concentration in Soil (mg/kg)	Oral - Soil Absorption Factor	Dermal - Soil Absorption Factor	Oral Reference Dose (mg/kg-day)	Chronic Average Daily Dose-Ing. (mg/kg-day)	Chronic Average Daily Dose-Der. (mg/kg-day)	Hazard Index - Ingestion	Hazard Index - Dermal Contact	Unit Hazard Index
1,4-Dichlorobenzene	1.00E+00	1	0.1	2.40E-03	3.79E-08	9.88E-09	1.58E-05	4.12E-06	1.99E-05
4-Nitroaniline	1.00E+00	1	0.1	3.00E-03	3.79E-08	9.88E-09	1.26E-05	3.29E-06	1.59E-05
Arsenic	1.00E+00	0.3	0.03	3.00E-04	1.14E-08	2.96E-09	3.79E-05	9.88E-06	4.78E-05
Benzo(a)anthracene	1.00E+00	0.29	0.13	NA	1.10E-08	1.28E-08	NA	NA	NC
Benzo(a)pyrene	1.00E+00	0.29	0.13	NA	1.10E-08	1.28E-08	NA	NA	NC
Benzo(b)fluoranthene	1.00E+00	0.29	0.13	NA	1.10E-08	1.28E-08	NA	NA	NC
Bis(2-ethylhexyl)phthalate	1.00E+00	1	0.1	2.00E-02	3.79E-08	9.88E-09	1.89E-06	4.94E-07	2.39E-06
Copper	1.00E+00	1	1	3.70E-02	3.79E-08	9.88E-08	1.02E-06	2.67E-06	3.69E-06
Dibenzo(a,h)anthracene	1.00E+00	0.29	0.13	NA	1.10E-08	1.28E-08	NA	NA	NC
Dieldrin	1.00E+00	1	0.1	5.00E-05	3.79E-08	9.88E-09	7.58E-04	1.98E-04	9.55E-04
Heptachlor	1.00E+00	1	0.1	5.00E-04	3.79E-08	9.88E-09	7.58E-05	1.98E-05	9.55E-05
Heptachlor epoxide	1.00E+00	1	0.1	1.30E-05	3.79E-08	9.88E-09	2.91E-03	7.60E-04	3.67E-03
Pentachlorophenol	1.00E+00	1	0.25	3.00E-02	3.79E-08	2.47E-08	1.26E-06	8.23E-07	2.09E-06
2,3,7,8-TCDD TEQ	1.00E+00	0.5	0.03	1.00E-09	1.89E-08	2.96E-09	1.89E+01	2.96E+00	2.19E+01
Total PCBs	1.00E+00	0.83	0.14	2.00E-05	3.14E-08	1.38E-08	1.57E-03	6.92E-04	2.26E-03

Noncarcinogenic Assessment - Scaling Table
 Risk by Dermal Contact with and Ingestion of Creek Bottom Soils
 MLE Recreational Teen
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Compound	Reference HQ (per mg/kg) (a)	Creek Segment B		Creek Segment D		Creek Segment E		Creek Segment F		SITE M	
		EPC (mg/kg)	HQ	EPC (mg/kg)	HQ						
1,4-Dichlorobenzene	1.99E-05	0.29	5.77E-06	--	NC	--	NC	--	NC	0.98	1.95E-05
4-Nitroaniline	1.59E-05	0.76	1.21E-05	--	NC	--	NC	--	NC	--	NC
Arsenic	4.78E-05	9.72	4.64E-04	11.40	5.45E-04	8.08	3.86E-04	9.71	4.64E-04	7.28	3.48E-04
Benzo(a)anthracene	NC	0.17	NC	--	NC	--	NC	--	NC	--	NC
Benzo(a)pyrene	NC	0.11	NC	0.08	NC	0.09	NC	0.07	NC	0.21	NC
Benzo(b)fluoranthene	NC	0.16	NC	--	NC	--	NC	--	NC	--	NC
Bis(2-ethylhexyl)phthalate	2.39E-06	1.77	4.23E-06	--	NC	--	NC	--	NC	--	NC
Copper	3.69E-06	484.20	1.79E-03	--	NC	425.21	1.57E-03	--	NC	1437.78	5.31E-03
Dibenzo(a,h)anthracene	NC	0.07	NC	--	NC	0.07	NC	--	NC	0.08	NC
Dieldrin	9.55E-04	0.008	7.64E-06	0.13	1.24E-04	--	NC	--	NC	--	NC
Heptachlor	9.55E-05	--	NC	--	NC	--	NC	--	NC	0.03	2.87E-06
Heptachlor epoxide	3.67E-03	0.01	3.67E-05	--	NC	--	NC	--	NC	0.11	4.04E-04
Pentachlorophenol	2.09E-06	0.99	2.07E-06	--	NC	--	NC	--	NC	--	NC
2,3,7,8-TCDD TEQ	2.19E+01	0.0003	6.57E-03	--	NC	--	NC	--	NC	0.00096	2.10E-02
Total PCBs	2.26E-03	2.78	6.29E-03	0.49	1.11E-03	0.19	4.30E-04	--	NC	5.40	1.22E-02
TOTAL			1.52E-02		1.78E-03		2.39E-03		4.64E-04		3.93E-02

Notes:

EPC - Exposure Point Concentration.

HQ - Hazard Quotient.

NC - Not Calculated.

-- Not a Compound of Potential Concern in this medium.

(a) - Reference HQ is multiplied by the EPC in each area to obtain the area HQ.

SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
RME

Receptors Evaluated	
Receptor 1:	RME Recreational Teen

**ASSUMPTIONS FOR RECREATIONAL TEEN - RME
INCIDENTIAL INGESTION AND DERMAL CONTACT CREEK BOTTOM SOILS**

		Assumed Value	Calculated Value
Soil Ingestion Rate	RME Recreational Teen	100	(mg soil/day)
Adherence Factor	RME Recreational Teen	0.3	(mg/cm ²)
Skin Exposed	RME Recreational Teen	3259	(cm ²)
Body Weight	RME Recreational Teen	47	(kg)
Exposure Frequency	RME Recreational Teen	26	(days)/365(days) = 7.12E-02
Exposure Duration (cancer)	RME Recreational Teen	11	(years)/70(years) = 1.57E-01
Exposure Duration (noncancer)	RME Recreational Teen	11	(yrs)/11(yrs) = 1.00E+00
Lifetime		70	(years)
Unit Conversion Factor		1.00E-06	(kg/mg)

19-Apr-06

SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS

RME

POTENTIAL CARCINOGENIC RISK

INCIDENTAL INGESTION AND DERMAL CONTACT

CREEK BOTTOM SOILS

RECREATIONAL TEEN - RME

Constituent	Unit in Soil (mg/kg)	Oral - Soil Absorption Factor	Dermal - Soil Absorption Factor	Oral Cancer Slope Factor (mg/kg-day) [*]	Lifetime Average Daily Dose-Ing. (mg/kg-day)	Lifetime Average Daily Dose-Der. (mg/kg-day)	Excess Lifetime Cancer Risk - Ingestion	Excess Lifetime Cancer Risk - Dermal Contact	Unit Cancer Risk
1,4-Dichlorobenzene	1.00E+00	1	0.1	1.30E-02	2.38E-08	2.33E-08	3.10E-10	3.03E-10	6.12E-10
4-Nitroaniline	1.00E+00	1	0.1	2.10E-02	2.38E-08	2.33E-08	5.00E-10	4.89E-10	9.89E-10
Arsenic	1.00E+00	0.3	0.03	1.50E+00	7.14E-09	6.99E-09	1.07E-08	1.05E-08	2.12E-08
Benzo(a)anthracene	1.00E+00	0.29	0.13	7.30E-01	6.91E-09	3.03E-08	5.04E-09	2.21E-08	2.71E-08
Benzo(a)pyrene	1.00E+00	0.29	0.13	7.30E+00	6.91E-09	3.03E-08	5.04E-08	2.21E-07	2.71E-07
Benzo(b)fluoranthene	1.00E+00	0.29	0.13	7.30E-01	6.91E-09	3.03E-08	5.04E-09	2.21E-08	2.71E-08
Bis(2-ethylhexyl)phthalate	1.00E+00	1	0.1	1.40E-02	2.38E-08	2.33E-08	3.33E-10	3.26E-10	6.59E-10
Copper	1.00E+00	1	1	NA	2.38E-08	2.33E-07	NA	NA	NC
Dibenzo(a,h)anthracene	1.00E+00	0.29	0.13	7.30E+00	6.91E-09	3.03E-08	5.04E-08	2.21E-07	2.71E-07
Dieldrin	1.00E+00	1	0.1	1.60E+01	2.38E-08	2.33E-08	3.81E-07	3.73E-07	7.54E-07
Heptachlor	1.00E+00	1	0.1	4.50E+00	2.38E-08	2.33E-08	1.07E-07	1.05E-07	2.12E-07
Heptachlor epoxide	1.00E+00	1	0.1	9.10E+00	2.38E-08	2.33E-08	2.17E-07	2.12E-07	4.29E-07
Pentachlorophenol	1.00E+00	1	0.25	1.20E-01	2.38E-08	5.82E-08	2.86E-09	6.99E-09	9.84E-09
2,3,7,8-TCDD TEQ	1.00E+00	0.5	0.03	1.50E+05	1.19E-08	6.99E-09	1.79E-03	1.05E-03	2.83E-03
Total PCBs	1.00E+00	0.83	0.14	2.00E+00	1.98E-08	3.26E-08	3.95E-08	6.52E-08	1.05E-07

Carcinogenic Assessment - Scaling Table
 Risk by Dermal Contact with and Ingestion of Creek Bottom Soils
 RME Recreational Teen
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Compound	Reference Risk (per mg/kg) (a)	Creek Segment B		Creek Segment D		Creek Segment E		Creek Segment F		SITE M	
		EPC (mg/kg)	Risk	EPC (mg/kg)	Risk						
1,4-Dichlorobenzene	6.12E-10	0.81	4.96E-10	--	NC	--	NC	--	NC	2.49	1.52E-09
4-Nitroaniline	9.89E-10	1.08	1.07E-09	--	NC	--	NC	--	NC	--	NC
Arsenic	2.12E-08	12.34	2.62E-07	15.05	3.19E-07	10.21	2.16E-07	11.38	2.41E-07	12.22	2.59E-07
Benzo(a)anthracene	2.71E-08	0.34	9.23E-09	--	NC	--	NC	--	NC	--	NC
Benzo(a)pyrene	2.71E-07	0.23	6.24E-08	0.13	3.53E-08	0.13	3.53E-08	0.09	2.44E-08	0.45	1.22E-07
Benzo(b)fluoranthene	2.71E-08	0.21	5.70E-09	--	NC	--	NC	--	NC	--	NC
Bis(2-ethylhexyl)phthalate	6.59E-10	8.96	5.91E-09	--	NC	--	NC	--	NC	--	NC
Copper	NC	1006.78	NC	--	NC	864.85	NC	--	NC	3225.79	NC
Dibenzo(a,h)anthracene	2.71E-07	0.08	2.17E-08	--	NC	0.08	2.17E-08	--	NC	0.13	3.53E-08
Dieldrin	7.54E-07	0.030	2.26E-08	0.69	5.20E-07	--	NC	--	NC	--	NC
Heptachlor	2.12E-07	--	NC	--	NC	--	NC	--	NC	0.06	1.27E-08
Heptachlor epoxide	4.29E-07	0.10	4.29E-08	--	NC	--	NC	--	NC	0.70	3.00E-07
Pentachlorophenol	9.84E-09	9.91	9.75E-08	--	NC	--	NC	--	NC	--	NC
2,3,7,8-TCDD TEQ	2.83E-03	0.00175	4.96E-06	--	NC	--	NC	--	NC	0.0020	5.67E-06
Total PCBs	1.05E-07	21.11	2.21E-06	2.20	2.30E-07	0.55	5.76E-08	--	NC	13.07	1.37E-06
TOTAL			7.70E-06		1.10E-06		3.31E-07		2.66E-07		7.77E-06

Notes:

EPC - Exposure Point Concentration.

NC - Not Calculated.

-- - Not a Compound of Potential Concern in this medium.

(a) - Reference risk is multiplied by the EPC in each area to obtain the potential risk.

SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS

RME

NONCARCINOGENIC HAZARD INDEX

INCIDENTAL INGESTION AND DERMAL CONTACT

CREEK BOTTOM SOILS

RECREATIONAL TEEN - RME

Constituent	Unit	Oral - Soil	Dermal - Soil	Oral Reference	Chronic Average	Chronic Average	Hazard Index - Ingestion	Hazard Index - Dermal	Unit Hazard Index
	Concentration in Soil (mg/kg)	Absorption Adjustment Factor	Absorption Adjustment Factor		Dose (mg/kg-day)	Daily Dose-Ing. (mg/kg-day)	Daily Dose-Der. (mg/kg-day)	Index	Index
1,4-Dichlorobenzene	1.00E+00	1	0.1	2.40E-03	1.52E-07	1.48E-07	6.31E-05	6.17E-05	1.25E-04
4-Nitroaniline	1.00E+00	1	0.1	3.00E-03	1.52E-07	1.48E-07	5.05E-05	4.94E-05	9.99E-05
Arsenic	1.00E+00	0.3	0.03	3.00E-04	4.55E-08	4.45E-08	1.52E-04	1.48E-04	3.00E-04
Benzo(a)anthracene	1.00E+00	0.29	0.13	NA	4.40E-08	1.93E-07	NA	NA	NC
Benzo(a)pyrene	1.00E+00	0.29	0.13	NA	4.40E-08	1.93E-07	NA	NA	NC
Benzo(b)fluoranthene	1.00E+00	0.29	0.13	NA	4.40E-08	1.93E-07	NA	NA	NC
Bis(2-ethylhexyl)phthalate	1.00E+00	1	0.1	2.00E-02	1.52E-07	1.48E-07	7.58E-06	7.41E-06	1.50E-05
Copper	1.00E+00	1	1	3.70E-02	1.52E-07	1.48E-06	4.10E-06	4.00E-05	4.41E-05
Dibenzo(a,h)anthracene	1.00E+00	0.29	0.13	NA	4.40E-08	1.93E-07	NA	NA	NC
Dieldrin	1.00E+00	1	0.1	5.00E-05	1.52E-07	1.48E-07	3.03E-03	2.96E-03	5.99E-03
Heptachlor	1.00E+00	1	0.1	5.00E-04	1.52E-07	1.48E-07	3.03E-04	2.96E-04	5.99E-04
Heptachlor epoxide	1.00E+00	1	0.1	1.30E-05	1.52E-07	1.48E-07	1.17E-02	1.14E-02	2.31E-02
Pentachlorophenol	1.00E+00	1	0.25	3.00E-02	1.52E-07	3.70E-07	5.05E-06	1.23E-05	1.74E-05
2,3,7,8-TCDD TEQ	1.00E+00	0.5	0.03	1.00E-09	7.58E-08	4.45E-08	7.58E+01	4.45E+01	1.20E+02
Total PCBs	1.00E+00	0.83	0.14	2.00E-05	1.26E-07	2.07E-07	6.29E-03	1.04E-02	1.67E-02

Noncarcinogenic Assessment - Scaling Table
 Risk by Dermal Contact with and Ingestion of Creek Bottom Soils
 RME Recreational Teen
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Compound	Reference HQ (per mg/kg) (a)	Creek Segment B		Creek Segment D		Creek Segment E		Creek Segment F		SITE M	
		EPC (mg/kg)	HQ	EPC (mg/kg)	HQ						
1,4-Dichlorobenzene	1.25E-04	0.81	1.01E-04	--	NC	--	NC	--	NC	2.49	3.11E-04
4-Nitroaniline	9.99E-05	1.08	1.08E-04	--	NC	--	NC	--	NC	--	NC
Arsenic	3.00E-04	12.34	3.70E-03	15.05	4.51E-03	10.21	3.06E-03	11.38	3.41E-03	12.22	3.66E-03
Benzo(a)anthracene	NC	0.34	NC	--	NC	--	NC	--	NC	--	NC
Benzo(a)pyrene	NC	0.23	NC	0.13	NC	0.13	NC	0.09	NC	0.45	NC
Benzo(b)fluoranthene	NC	0.21	NC	--	NC	--	NC	--	NC	--	NC
Bis(2-ethylhexyl)phthalate	1.50E-05	8.96	1.34E-04	--	NC	--	NC	--	NC	--	NC
Copper	4.41E-05	1006.78	4.44E-02	--	NC	864.85	3.82E-02	--	NC	3225.79	1.42E-01
Dibenzo(a,h)anthracene	NC	0.08	NC	--	NC	0.08	NC	--	NC	0.13	NC
Dieldrin	5.99E-03	0.030	1.80E-04	0.69	4.14E-03	--	NC	--	NC	--	NC
Heptachlor	5.99E-04	--	NC	--	NC	--	NC	--	NC	0.06	3.60E-05
Heptachlor epoxide	2.31E-02	0.10	2.31E-03	--	NC	--	NC	--	NC	0.70	1.61E-02
Pentachlorophenol	1.74E-05	9.91	1.72E-04	--	NC	--	NC	--	NC	--	NC
2,3,7,8-TCDD TEQ	1.20E+02	0.00175	2.10E-01	--	NC	--	NC	--	NC	0.0020	2.40E-01
Total PCBs	1.67E-02	21.11	3.52E-01	2.20	3.67E-02	0.55	9.16E-03	--	NC	13.07	2.18E-01
TOTAL			6.13E-01		4.53E-02		5.04E-02		3.41E-03		6.21E-01

Notes:

EPC - Exposure Point Concentration.

HQ - Hazard Quotient.

NC - Not Calculated.

-- - Not a Compound of Potential Concern in this medium.

(a) - Reference HQ is multiplied by the EPC in each area to obtain the area HQ.

Receptors Evaluated	
Receptor 1:	MLE Recreational Child

ASSUMPTIONS FOR RECREATIONAL CHILD - MLE INCIDENTIAL INGESTION AND DERMAL CONTACT CREEK BOTTOM SOILS		Assumed Value	Units	Calculated Value
Soil Ingestion Rate	MLE Recreational Child	100	(mg soil/day)	
Adherence Factor	MLE Recreational Child	0.04	(mg/cm ²)	
Skin Exposed	MLE Recreational Child	2800	(cm ²)	
Body Weight	MLE Recreational Child	15	(kg)	
Exposure Frequency	MLE Recreational Child	13	(days)/365(days) =	3.56E-02
Exposure Duration (cancer)	MLE Recreational Child	6	(years)/70(years) =	8.57E-02
Exposure Duration (noncancer)	MLE Recreational Child	6	(yrs)/6(yrs) =	1.00E+00
Lifetime		70	(years)	
Unit Conversion Factor		1.00E-06	(kg/mg)	

POTENTIAL CARCINOGENIC RISK
 INCIDENTAL INGESTION AND DERMAL CONTACT
 RECREATIONAL CHILD - MLE
 SAUGET AREA 1 EE/CA AND RI/FS ADDENDUM - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Constituent	Unit Concentration in Soil (mg/kg)	Oral - Soil Absorption Factor	Dermal - Soil Absorption Factor	Oral Cancer Slope Factor (mg/kg-day) ⁻¹	Lifetime Average Daily Dose-Ing. (mg/kg-day)	Lifetime Average Daily Dose-Der. (mg/kg-day)	Lifetime Excess Cancer Risk - Ingestion	Lifetime Excess Cancer Risk - Dermal Contact	Unit Cancer Risk
1,4-Dichlorobenzene	1.00E+00	1	0.1	1.30E-02	2.04E-08	2.28E-09	2.65E-10	2.96E-11	2.94E-10
4-Nitroaniline	1.00E+00	1	0.1	2.10E-02	2.04E-08	2.28E-09	4.27E-10	4.79E-11	4.75E-10
Arsenic	1.00E+00	0.3	0.03	1.50E+00	6.11E-09	6.84E-10	9.16E-09	1.03E-09	1.02E-08
Benzo(a)anthracene	1.00E+00	0.29	0.13	7.30E-01	5.90E-09	2.96E-09	4.31E-09	2.16E-09	6.47E-09
Benzo(a)pyrene	1.00E+00	0.29	0.13	7.30E+00	5.90E-09	2.96E-09	4.31E-08	2.16E-08	6.47E-08
Benzo(b)fluoranthene	1.00E+00	0.29	0.13	7.30E-01	5.90E-09	2.96E-09	4.31E-09	2.16E-09	6.47E-09
Bis(2-ethylhexyl)phthalate	1.00E+00	1	0.1	1.40E-02	2.04E-08	2.28E-09	2.85E-10	3.19E-11	3.17E-10
Copper	1.00E+00	1	1	NA	2.04E-08	2.28E-08	NA	NA	NC
Dibenzo(a,h)anthracene	1.00E+00	0.29	0.13	7.30E+00	5.90E-09	2.96E-09	4.31E-08	2.16E-08	6.47E-08
Dieldrin	1.00E+00	1	0.1	1.60E+01	2.04E-08	2.28E-09	3.26E-07	3.65E-08	3.62E-07
Heptachlor	1.00E+00	1	0.1	4.50E+00	2.04E-08	2.28E-09	9.16E-08	1.03E-08	1.02E-07
Heptachlor epoxide	1.00E+00	1	0.1	9.10E+00	2.04E-08	2.28E-09	1.85E-07	2.07E-08	2.06E-07
Pentachlorophenol	1.00E+00	1	0.25	1.20E-01	2.04E-08	5.70E-09	2.44E-09	6.84E-10	3.13E-09
2,3,7,8-TCDD TEQ	1.00E+00	0.5	0.03	1.50E+05	1.02E-08	6.84E-10	1.53E-03	1.03E-04	1.63E-03
Total PCBs	1.00E+00	0.83	0.14	2.00E+00	1.69E-08	3.19E-09	3.38E-08	6.38E-09	4.02E-08

CARCINOGENIC ASSESSMENT - SCALING TABLE
 RISK BY DERMAL CONTACT WITH AND INGESTION OF CREEK BOTTOM SOILS
 RECREATIONAL CHILD - MLE
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Compound	Reference Risk (per mg/kg) (a)	Creek Segment B		Creek Segment D		Creek Segment E		Creek Segment F	
		EPC (mg/kg)	Risk						
1,4-Dichlorobenzene	2.94E-10	0.29	8.53E-11	--	NC	--	NC	--	NC
4-Nitroaniline	4.75E-10	0.76	3.61E-10	--	NC	--	NC	--	NC
Arsenic	1.02E-08	9.72	9.90E-08	11.40	1.16E-07	8.08	8.23E-08	9.71	9.89E-08
Benzo(a)anthracene	6.47E-09	0.17	1.10E-09	--	NC	--	NC	--	NC
Benzo(a)pyrene	6.47E-08	0.11	7.12E-09	0.08	5.18E-09	0.09	5.82E-09	0.07	4.50E-09
Benzo(b)fluoranthene	6.47E-09	0.16	1.04E-09	--	NC	--	NC	--	NC
Bis(2-ethylhexyl)phthalate	3.17E-10	1.77	5.61E-10	--	NC	--	NC	--	NC
Copper	NC	484.20	NC	--	NC	425.21	NC	--	NC
Dibenzo(a,h)anthracene	6.47E-08	0.07	4.53E-09	--	NC	0.07	4.53E-09	--	NC
Dieldrin	3.62E-07	0.008	2.90E-09	0.13	4.71E-08	--	NC	--	NC
Heptachlor	1.02E-07	--	NC	--	NC	--	NC	--	NC
Heptachlor epoxide	2.06E-07	0.01	2.06E-09	--	NC	--	NC	--	NC
Pentachlorophenol	3.13E-09	0.99	3.09E-09	--	NC	--	NC	--	NC
2,3,7,8-TCDD TEQ	1.63E-03	0.00030	4.89E-07	--	NC	--	NC	--	NC
Total PCBs	4.02E-08	2.78	1.12E-07	0.49	1.97E-08	0.19	7.63E-09	--	NC
TOTAL			7.22E-07		1.88E-07		1.00E-07		1.03E-07

Notes:

EPC - Exposure Point Concentration.

NC - Not Calculated.

-- - Not a Compound of Potential Concern in this medium.

(a) - Reference risk is multiplied by the EPC in each area to obtain the potential risk.

NONCARCINOGENIC HAZARD INDEX
INCIDENTIAL INGESTION AND DERMAL CONTACT
RECREATIONAL CHILD - MLE
SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
HUMAN HEALTH RISK ASSESSMENT

Constituent	Unit Concentration in Soil (mg/kg)	Oral - Soil Absorption Factor	Dermal - Soil Absorption Factor	Oral Reference Dose (mg/kg-day)	ADDing MLE (mg/kg-day)	ADDder Recreational Child MLE (mg/kg-day)	Hazard Index - Ingestion	Hazard Index - Dermal Contact	Unit Hazard Index
1,4-Dichlorobenzene	1.00E+00	1	0.1	2.40E-03	2.37E-07	2.66E-08	9.89E-05	1.11E-05	1.10E-04
4-Nitroaniline	1.00E+00	1	0.1	3.00E-03	2.37E-07	2.66E-08	7.91E-05	8.86E-06	8.80E-05
Arsenic	1.00E+00	0.3	0.03	3.00E-04	7.12E-08	7.98E-09	2.37E-04	2.66E-05	2.64E-04
Benzo(a)anthracene	1.00E+00	0.29	0.13	NA	6.89E-08	3.46E-08	NA	NA	NC
Benzo(a)pyrene	1.00E+00	0.29	0.13	NA	6.89E-08	3.46E-08	NA	NA	NC
Benzo(b)fluoranthene	1.00E+00	0.29	0.13	NA	6.89E-08	3.46E-08	NA	NA	NC
Bis(2-ethylhexyl)phthalate	1.00E+00	1	0.1	2.00E-02	2.37E-07	2.66E-08	1.19E-05	1.33E-06	1.32E-05
Copper	1.00E+00	1	1	3.70E-02	2.37E-07	2.66E-07	6.42E-06	7.19E-06	1.36E-05
Dibenzo(a,h)anthracene	1.00E+00	0.29	0.13	NA	6.89E-08	3.46E-08	NA	NA	NC
Dieldrin	1.00E+00	1	0.1	5.00E-05	2.37E-07	2.66E-08	4.75E-03	5.32E-04	5.28E-03
Heptachlor	1.00E+00	1	0.1	5.00E-04	2.37E-07	2.66E-08	4.75E-04	5.32E-05	5.28E-04
Heptachlor epoxide	1.00E+00	1	0.1	1.30E-05	2.37E-07	2.66E-08	1.83E-02	2.05E-03	2.03E-02
Pentachlorophenol	1.00E+00	1	0.25	3.00E-02	2.37E-07	6.65E-08	7.91E-06	2.22E-06	1.01E-05
2,3,7,8-TCDD TEQ	1.00E+00	0.5	0.03	1.00E-09	1.19E-07	7.98E-09	1.19E+02	7.98E+00	1.27E+02
Total PCBs	1.00E+00	0.83	0.14	2.00E-05	1.97E-07	3.72E-08	9.85E-03	1.86E-03	1.17E-02

NONCARCINOGENIC ASSESSMENT - SCALING TABLE
 RISK BY DERMAL CONTACT WITH AND INGESTION OF CREEK BOTTOM SOILS
 RECREATIONAL CHILD - MLE
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Compound	Reference HQ (per mg/kg) (a)	Creek Segment B		Creek Segment D		Creek Segment E		Creek Segment F	
		EPC (mg/kg)	HQ						
1,4-Dichlorobenzene	1.10E-04	0.29	3.19E-05	--	NC	--	NC	--	NC
4-Nitroaniline	8.80E-05	0.76	6.69E-05	--	NC	--	NC	--	NC
Arsenic	2.64E-04	9.72	2.57E-03	11.40	3.01E-03	8.08	2.13E-03	9.71	2.56E-03
Benzo(a)anthracene	NC	0.17	NC	--	NC	--	NC	--	NC
Benzo(a)pyrene	NC	0.11	NC	0.08	NC	0.09	NC	0.07	NC
Benzo(b)fluoranthene	NC	0.16	NC	--	NC	--	NC	--	NC
Bis(2-ethylhexyl)phthalate	1.32E-05	1.77	2.34E-05	--	NC	--	NC	--	NC
Copper	1.36E-05	484.20	6.59E-03	--	NC	425.21	5.78E-03	--	NC
Dibenzo(a,h)anthracene	NC	0.07	NC	--	NC	0.07	NC	--	NC
Dieldrin	5.28E-03	0.01	4.22E-05	0.13	6.86E-04	--	NC	--	NC
Heptachlor	5.28E-04	--	NC	--	NC	--	NC	--	NC
Heptachlor epoxide	2.03E-02	0.01	2.03E-04	--	NC	--	NC	--	NC
Pentachlorophenol	1.01E-05	0.99	1.00E-05	--	NC	--	NC	--	NC
2,3,7,8-TCDD TEQ	1.27E+02	0.00030	3.80E-02	--	NC	--	NC	--	NC
Total PCBs	1.17E-02	2.78	3.26E-02	0.49	5.74E-03	0.19	2.23E-03	--	NC
TOTAL			8.01E-02		9.44E-03		1.01E-02		2.56E-03

Notes:

EPC - Exposure Point Concentration.

HQ - Hazard Quotient.

NC - Not Calculated.

-- - Not a Compound of Potential Concern in this medium.

(a) - Reference HQ is multiplied by the EPC in each area to obtain the area HQ.

Receptors Evaluated	
Receptor 1:	MLE Recreational Child

ASSUMPTIONS FOR RECREATIONAL CHILD - MLE INCIDENTIAL INGESTION AND DERMAL CONTACT CREEK BOTTOM SOILS		Assumed Value	Units	Calculated Value
Soil Ingestion Rate	MLE Recreational Child	100	(mg soil/day)	
Adherence Factor	MLE Recreational Child	0.04	(mg/cm ²)	
Skin Exposed	MLE Recreational Child	2800	(cm ²)	
Body Weight	MLE Recreational Child	15	(kg)	
Exposure Frequency	MLE Recreational Child	13	(days)/365(days) =	3.56E-02
Exposure Duration (cancer)	MLE Recreational Child	6	(years)/70(years) =	8.57E-02
Exposure Duration (noncancer)	MLE Recreational Child	6	(yrs)/6(yrs) =	1.00E+00
Lifetime		70	(years)	
Unit Conversion Factor		1.00E-06	(kg/mg)	

Creek Segment B PCBs - Post Excavation

POTENTIAL CARCINOGENIC RISK

INCIDENTIAL INGESTION AND DERMAL CONTACT

RECREATIONAL CHILD - MLE

SAUGET AREA 1 EE/CA AND RI/FS ADDENDUM - CREEK BOTTOM SOILS

HUMAN HEALTH RISK ASSESSMENT

Constituent	Oral - Soil	Dermal - Soil	Oral	Lifetime	Lifetime				
	Concentration in Soil (mg/kg)	Absorption Adjustment Factor	Absorption Adjustment Factor	Cancer Slope Factor (mg/kg-day) ⁻¹	Daily Dose-Ing. (mg/kg-day)	Daily Dose-Der. (mg/kg-day)	Excess Lifetime Cancer Risk - Ingestion	Excess Lifetime Cancer Risk - Dermal Contact	Cancer Risk
Total PCBs	8.00E-02	0.83	0.14	2.00E+00	1.35E-09	2.55E-10	2.70E-09	5.11E-10	3.21E-09

Creek Segment B PCBs - Post Excavation**NONCARCINOGENIC HAZARD INDEX****INCIDENTAL INGESTION AND DERMAL CONTACT****RECREATIONAL CHILD - MLE****SAUGET AREA 1 EE/CA AND RI/FS ADDENDUM - CREEK BOTTOM SOILS****HUMAN HEALTH RISK ASSESSMENT**

Constituent	Oral - Soil Concentration in Soil (mg/kg)	Oral - Soil Absorption Adjustment Factor	Dermal - Soil Absorption Adjustment Factor	Oral Reference Dose (mg/kg-day)	Chronic Average Daily Dose-Ing. (mg/kg-day)	Chronic Average Daily Dose-Der. (mg/kg-day)	Hazard Index - Ingestion	Hazard Index - Dermal Contact	Hazard Index
Total PCBs	8.00E-02	0.83	0.14	2.00E-05	1.58E-08	2.98E-09	7.88E-04	1.49E-04	9.37E-04

Receptors Evaluated	
Receptor 1:	RME Recreational Child

ASSUMPTIONS FOR RECREATIONAL CHILD - RME INCIDENTIAL INGESTION AND DERMAL CONTACT CREEK BOTTOM SOILS		Assumed Value	Calculated Value
		Units	
Soil Ingestion Rate	RME Recreational Child	200	(mg soil/day)
Adherence Factor	RME Recreational Child	0.2	(mg/cm ²)
Skin Exposed	RME Recreational Child	2800	(cm ²)
Body Weight	RME Recreational Child	15	(kg)
Exposure Frequency	RME Recreational Child	26	(days)/365(days) = 7.12E-02
Exposure Duration (cancer)	RME Recreational Child	6	(years)/70(years) = 8.57E-02
Exposure Duration (noncancer)	RME Recreational Child	6	(yrs)/6(yrs) = 1.00E+00
Lifetime		70	(years)
Unit Conversion Factor		1.00E-06	(kg/mg)

POTENTIAL CARCINOGENIC RISK
 INCIDENTAL INGESTION AND DERMAL CONTACT
 RECREATIONAL CHILD - RME
 SAUGET AREA 1 EE/CA AND RI/FS ADDENDUM - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Constituent	Unit Concentration in Soil (mg/kg)	Oral - Soil Absorption Factor	Dermal - Soil Absorption Factor	Oral Cancer Slope Factor (mg/kg-day) ^{**}	Lifetime Average Daily Dose-Ing. (mg/kg-day)	Lifetime Average Daily Dose-Der. (mg/kg-day)	Lifetime Excess Cancer Risk - Ingestion	Lifetime Excess Cancer Risk - Dermal Contact	Unit Cancer Risk
1,4-Dichlorobenzene	1.00E+00	1	0.1	1.30E-02	8.14E-08	2.28E-08	1.06E-09	2.96E-10	1.35E-09
4-Nitroaniline	1.00E+00	1	0.1	2.10E-02	8.14E-08	2.28E-08	1.71E-09	4.79E-10	2.19E-09
Arsenic	1.00E+00	0.3	0.03	1.50E+00	2.44E-08	6.84E-09	3.66E-08	1.03E-08	4.69E-08
Benzo(a)anthracene	1.00E+00	0.29	0.13	7.30E-01	2.36E-08	2.96E-08	1.72E-08	2.16E-08	3.89E-08
Benzo(a)pyrene	1.00E+00	0.29	0.13	7.30E+00	2.36E-08	2.96E-08	1.72E-07	2.16E-07	3.89E-07
Benzo(b)fluoranthene	1.00E+00	0.29	0.13	7.30E-01	2.36E-08	2.96E-08	1.72E-08	2.16E-08	3.89E-08
Bis(2-ethylhexyl)phthalate	1.00E+00	1	0.1	1.40E-02	8.14E-08	2.28E-08	1.14E-09	3.19E-10	1.46E-09
Copper	1.00E+00	1	1	NA	8.14E-08	2.28E-07	NA	NA	NC
Dibenzo(a,h)anthracene	1.00E+00	0.29	0.13	7.30E+00	2.36E-08	2.96E-08	1.72E-07	2.16E-07	3.89E-07
Dieldrin	1.00E+00	1	0.1	1.60E+01	8.14E-08	2.28E-08	1.30E-06	3.65E-07	1.67E-06
Heptachlor	1.00E+00	1	0.1	4.50E+00	8.14E-08	2.28E-08	3.66E-07	1.03E-07	4.69E-07
Heptachlor epoxide	1.00E+00	1	0.1	9.10E+00	8.14E-08	2.28E-08	7.41E-07	2.07E-07	9.48E-07
Pentachlorophenol	1.00E+00	1	0.25	1.20E-01	8.14E-08	5.70E-08	9.77E-09	6.84E-09	1.66E-08
2,3,7,8-TCDD TEQ	1.00E+00	0.5	0.03	1.50E+05	4.07E-08	6.84E-09	6.11E-03	1.03E-03	7.13E-03
Total PCBs	1.00E+00	0.83	0.14	2.00E+00	6.76E-08	3.19E-08	1.35E-07	6.38E-08	1.99E-07

CARCINOGENIC ASSESSMENT - SCALING TABLE
 RISK BY DERMAL CONTACT WITH AND INGESTION OF CREEK BOTTOM SOILS
 RECREATIONAL CHILD - RME
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Compound	Reference Risk (per mg/kg) (a)	Creek Segment B		Creek Segment D		Creek Segment E		Creek Segment F	
		EPC (mg/kg)	Risk						
1,4-Dichlorobenzene	1.35E-09	0.81	1.10E-09	--	NC	--	NC	--	NC
4-Nitroaniline	2.19E-09	1.08	2.36E-09	--	NC	--	NC	--	NC
Arsenic	4.69E-08	12.34	5.79E-07	15.05	7.06E-07	10.21	4.79E-07	11.38	5.34E-07
Benzo(a)anthracene	3.89E-08	0.34	1.32E-08	--	NC	--	NC	--	NC
Benzo(a)pyrene	3.89E-07	0.23	8.94E-08	0.13	5.05E-08	0.13	5.05E-08	0.09	3.50E-08
Benzo(b)fluoranthene	3.89E-08	0.21	8.16E-09	--	NC	--	NC	--	NC
Bis(2-ethylhexyl)phthalate	1.46E-09	8.96	1.31E-08	--	NC	--	NC	--	NC
Copper	NC	1006.78	NC	--	NC	864.85	NC	--	NC
Dibenzo(a,h)anthracene	3.89E-07	0.08	3.11E-08	--	NC	0.08	3.11E-08	--	NC
Dieldrin	1.67E-06	0.030	5.00E-08	0.69	1.15E-06	--	NC	--	NC
Heptachlor	4.69E-07	--	NC	--	NC	--	NC	--	NC
Heptachlor epoxide	9.48E-07	0.10	9.48E-08	--	NC	--	NC	--	NC
Pentachlorophenol	1.66E-08	9.91	1.65E-07	--	NC	--	NC	--	NC
2,3,7,8-TCDD TEQ	7.13E-03	0.00175	1.25E-05	--	NC	--	NC	--	NC
Total PCBs	1.99E-07	21.11	4.20E-06	2.20	4.38E-07	0.55	1.09E-07	--	NC
TOTAL			1.77E-05		2.34E-06		6.70E-07		5.69E-07

Notes:

EPC - Exposure Point Concentration.

NC - Not Calculated.

-- - Not a Compound of Potential Concern in this medium.

(a) - Reference risk is multiplied by the EPC in each area to obtain the potential risk.

NONCARCINOGENIC HAZARD INDEX
INCIDENTIAL INGESTION AND DERMAL CONTACT
RECREATIONAL CHILD - RME
SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
HUMAN HEALTH RISK ASSESSMENT

Constituent	Unit Concentration in Soil (mg/kg)	Oral - Soil Absorption Adjustment Factor	Dermal - Soil Absorption Adjustment Factor	Oral Reference Dose (mg/kg-day)	Chronic Average Daily Dose-Der. (mg/kg-day)	Chronic Average Daily Dose-Ing. (mg/kg-day)	Hazard Index - Ingestion	Hazard Index - Dermal Contact	Unit Hazard Index
1,4-Dichlorobenzene	1.00E+00	1	0.1	2.40E-03	9.50E-07	2.66E-07	3.96E-04	1.11E-04	5.07E-04
4-Nitroaniline	1.00E+00	1	0.1	3.00E-03	9.50E-07	2.66E-07	3.17E-04	8.86E-05	4.05E-04
Arsenic	1.00E+00	0.3	0.03	3.00E-04	2.85E-07	7.98E-08	9.50E-04	2.66E-04	1.22E-03
Benzo(a)anthracene	1.00E+00	0.29	0.13	NA	2.75E-07	3.46E-07	NA	NA	NC
Benzo(a)pyrene	1.00E+00	0.29	0.13	NA	2.75E-07	3.46E-07	NA	NA	NC
Benzo(b)fluoranthene	1.00E+00	0.29	0.13	NA	2.75E-07	3.46E-07	NA	NA	NC
Bis(2-ethylhexyl)phthalate	1.00E+00	1	0.1	2.00E-02	9.50E-07	2.66E-07	4.75E-05	1.33E-05	6.08E-05
Copper	1.00E+00	1	1	3.70E-02	9.50E-07	2.66E-06	2.57E-05	7.19E-05	9.75E-05
Dibenzo(a,h)anthracene	1.00E+00	0.29	0.13	NA	2.75E-07	3.46E-07	NA	NA	NC
Dieldrin	1.00E+00	1	0.1	5.00E-05	9.50E-07	2.66E-07	1.90E-02	5.32E-03	2.43E-02
Heptachlor	1.00E+00	1	0.1	5.00E-04	9.50E-07	2.66E-07	1.90E-03	5.32E-04	2.43E-03
Heptachlor epoxide	1.00E+00	1	0.1	1.30E-05	9.50E-07	2.66E-07	7.31E-02	2.05E-02	9.35E-02
Pentachlorophenol	1.00E+00	1	0.25	3.00E-02	9.50E-07	6.65E-07	3.17E-05	2.22E-05	5.38E-05
2,3,7,8-TCDD TEQ	1.00E+00	0.5	0.03	1.00E-09	4.75E-07	7.98E-08	4.75E+02	7.98E+01	5.55E+02
Total PCBs	1.00E+00	0.83	0.14	2.00E-05	7.88E-07	3.72E-07	3.94E-02	1.86E-02	5.80E-02

NONCARCINOGENIC ASSESSMENT - SCALING TABLE
 RISK BY DERMAL CONTACT WITH AND INGESTION OF CREEK BOTTOM SOILS
 RECREATIONAL CHILD - RME
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Compound	Reference HQ (per mg/kg) (a)	Creek Segment B		Creek Segment D		Creek Segment E		Creek Segment F	
		EPC (mg/kg)	HQ						
1,4-Dichlorobenzene	5.07E-04	0.81	4.10E-04	--	NC	--	NC	--	NC
4-Nitroaniline	4.05E-04	1.08	4.38E-04	--	NC	--	NC	--	NC
Arsenic	1.22E-03	12.34	1.50E-02	15.05	1.83E-02	10.21	1.24E-02	11.38	1.38E-02
Benzo(a)anthracene	NC	0.34	NC	--	NC	--	NC	--	NC
Benzo(a)pyrene	NC	0.23	NC	0.13	NC	0.13	NC	0.09	NC
Benzo(b)fluoranthene	NC	0.21	NC	--	NC	--	NC	--	NC
Bis(2-ethylhexyl)phthalate	6.08E-05	8.96	5.45E-04	--	NC	--	NC	--	NC
Copper	9.75E-05	1006.78	9.82E-02	--	NC	864.85	8.44E-02	--	NC
Dibenzo(a,h)anthracene	NC	0.08	NC	--	NC	0.08	NC	--	NC
Dieldrin	2.43E-02	0.030	7.29E-04	0.69	1.68E-02	--	NC	--	NC
Heptachlor	2.43E-03	--	NC	--	NC	--	NC	--	NC
Heptachlor epoxide	9.35E-02	0.10	9.35E-03	--	NC	--	NC	--	NC
Pentachlorophenol	5.38E-05	9.91	5.33E-04	--	NC	--	NC	--	NC
2,3,7,8-TCDD TEQ	5.55E+02	0.00175	9.71E-01	--	NC	--	NC	--	NC
Total PCBs	5.80E-02	21.11	1.23E+00	2.20	1.28E-01	0.55	3.19E-02	--	NC
TOTAL			2.32E+00		1.63E-01		1.29E-01		1.38E-02

Notes:

EPC - Exposure Point Concentration.

HQ - Hazard Quotient.

NC - Not Calculated.

-- - Not a Compound of Potential Concern in this medium.

(a) - Reference HQ is multiplied by the EPC in each area to obtain the area HQ.

Receptors Evaluated	
Receptor 1:	RME Recreational Child

ASSUMPTIONS FOR RECREATIONAL CHILD - RME INCIDENTIAL INGESTION AND DERMAL CONTACT CREEK BOTTOM SOILS		Assumed Value	Units	Calculated Value
Soil Ingestion Rate	RME Recreational Child	200	(mg soil/day)	
Adherence Factor	RME Recreational Child	0.2	(mg/cm ²)	
Skin Exposed	RME Recreational Child	2800	(cm ²)	
Body Weight	RME Recreational Child	15	(kg)	
Exposure Frequency	RME Recreational Child	26	(days)/365(days) =	7.12E-02
Exposure Duration (cancer)	RME Recreational Child	6	(years)/70(years) =	8.57E-02
Exposure Duration (noncancer)	RME Recreational Child	6	(yrs)/6(yrs) =	1.00E+00
Lifetime		70	(years)	
Unit Conversion Factor		1.00E-06	(kg/mg)	

Creek Segment B PCBs - Post Excavation

POTENTIAL CARCINOGENIC RISK

INCIDENTIAL INGESTION AND DERMAL CONTACT

RECREATIONAL CHILD - RME

SAUGET AREA 1 EE/CA AND RI/FS ADDENDUM - CREEK BOTTOM SOILS

HUMAN HEALTH RISK ASSESSMENT

Constituent	Oral - Soil	Dermal - Soil	Oral	Lifetime	Lifetime				
	Concentration in Soil	Absorption Adjustment	Absorption Adjustment	Cancer Slope Factor	Daily Dose-Ing. (mg/kg-day) ^{**}	Daily Dose-Der. (mg/kg-day)	Average Excess Lifetime Cancer Risk - Ingestion	Average Excess Lifetime Cancer Risk - Dermal Contact	Average Excess Lifetime Cancer Risk
Total PCBs	1.50E-01	0.83	0.14	2.00E+00	1.01E-08	4.79E-09	2.03E-08	9.57E-09	2.98E-08

Creek Segment B PCBs - Post Excavation**NONCARCINOGENIC HAZARD INDEX****INCIDENTAL INGESTION AND DERMAL CONTACT****RECREATIONAL CHILD - RME****SAUGET AREA 1 EE/CA AND RI/FS ADDENDUM - CREEK BOTTOM SOILS****HUMAN HEALTH RISK ASSESSMENT**

Constituent	Oral - Soil Concentration in Soil (mg/kg)	Dermal - Soil Absorption Adjustment Factor	Oral Reference Dose (mg/kg-day)	Chronic Average Daily Dose-Ing. (mg/kg-day)	Chronic Average Daily Dose-Der. (mg/kg-day)	Hazard Index - Ingestion	Hazard Index - Dermal Contact	Hazard Index
Total PCBs	1.50E-01	0.83	0.14	2.00E-05	1.18E-07	5.58E-08	5.91E-03	2.79E-03 8.70E-03

SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
MLE

Receptors Evaluated	
Receptor 1:	MLE Construction Worker

ASSUMPTIONS FOR CONSTRUCTION WORKER - MLE INCIDENTIAL INGESTION AND DERMAL CONTACT CREEK BOTTOM SOILS		Assumed Value	Units	Calculated Value
Soil Ingestion Rate	MLE Construction Worker	64	(mg soil/day)	
Adherence Factor	MLE Construction Worker	0.10	(mg/cm ²)	
Skin Exposed	MLE Construction Worker	2479	(cm ²)	
Body Weight	MLE Construction Worker	70	(kg)	
Exposure Frequency	MLE Construction Worker	20	(days)/365(days) =	5.48E-02
Exposure Duration (cancer)	MLE Construction Worker	1	(years)/70(years) =	1.43E-02
Exposure Duration (noncancer)	MLE Construction Worker	1	(yrs)/1(yrs) =	1.00E+00
Lifetime		70	(years)	
Unit Conversion Factor		1.00E-06	(kg/mg)	

19-Apr-06

SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS

MLE

POTENTIAL CARCINOGENIC RISK

INCIDENTIAL INGESTION AND DERMAL CONTACT

CREEK BOTTOM SOILS

CONSTRUCTION WORKER - MLE

Constituent	Unit Concentration in Soil (mg/kg)	Oral - Soil Absorption Factor	Dermal - Soil Absorption Factor	Oral Cancer Slope Factor (mg/kg-day) ⁻¹	Lifetime Average Daily Dose-Ing. (mg/kg-day)	Lifetime Average Daily Dose-Der. (mg/kg-day)	Excess Lifetime Cancer Risk - Ingestion	Lifetime Excess Lifetime Cancer Risk - Dermal Contact	Unit Cancer Risk
1,4-Dichlorobenzene	1.00E+00	1	0.1	1.30E-02	7.16E-10	2.77E-10	9.30E-12	3.60E-12	1.29E-11
4-Nitroaniline	1.00E+00	1	0.1	2.10E-02	7.16E-10	2.77E-10	1.50E-11	5.82E-12	2.09E-11
Arsenic	1.00E+00	0.3	0.03	1.50E+00	2.15E-10	8.32E-11	3.22E-10	1.25E-10	4.47E-10
Benzo(a)anthracene	1.00E+00	0.29	0.13	7.30E-01	2.08E-10	3.60E-10	1.52E-10	2.63E-10	4.15E-10
Benzo(a)pyrene	1.00E+00	0.29	0.13	7.30E+00	2.08E-10	3.60E-10	1.52E-09	2.63E-09	4.15E-09
Benzo(b)fluoranthene	1.00E+00	0.29	0.13	7.30E-01	2.08E-10	3.60E-10	1.52E-10	2.63E-10	4.15E-10
Bis(2-ethylhexyl)phthalate	1.00E+00	1	0.1	1.40E-02	7.16E-10	2.77E-10	1.00E-11	3.88E-12	1.39E-11
Copper	1.00E+00	1	1	NA	7.16E-10	2.77E-09	NA	NA	NC
Dibenzo(a,h)anthracene	1.00E+00	0.29	0.13	7.30E+00	2.08E-10	3.60E-10	1.52E-09	2.63E-09	4.15E-09
Dieldrin	1.00E+00	1	0.1	1.60E+01	7.16E-10	2.77E-10	1.15E-08	4.44E-09	1.59E-08
Heptachlor	1.00E+00	1	0.1	4.50E+00	7.16E-10	2.77E-10	3.22E-09	1.25E-09	4.47E-09
Heptachlor epoxide	1.00E+00	1	0.1	9.10E+00	7.16E-10	2.77E-10	6.51E-09	2.52E-09	9.04E-09
Pentachlorophenol	1.00E+00	1	0.25	1.20E-01	7.16E-10	6.93E-10	8.59E-11	8.32E-11	1.69E-10
2,3,7,8-TCDD TEQ	1.00E+00	0.5	0.03	1.50E+05	3.58E-10	8.32E-11	5.37E-05	1.25E-05	6.62E-05
Total PCBs	1.00E+00	0.83	0.14	2.00E+00	5.94E-10	3.88E-10	1.19E-09	7.76E-10	1.96E-09

Carcinogenic Assessment - Scaling Table
 Risk by Dermal Contact with and Ingestion of Creek Bottom Soils
 MLE Construction Worker
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Compound	Reference Risk (per mg/kg) (a)	Creek Segment B		Creek Segment D		Creek Segment E		Creek Segment F		SITE M	
		EPC (mg/kg)	Risk	EPC (mg/kg)	Risk						
1,4-Dichlorobenzene	1.29E-11	0.29	3.74E-12	--	NC	--	NC	--	NC	0.98	1.26E-11
4-Nitroaniline	2.09E-11	0.76	1.58E-11	--	NC	--	NC	--	NC	--	NC
Arsenic	4.47E-10	9.72	4.34E-09	11.40	5.09E-09	8.08	3.61E-09	9.71	4.34E-09	7.28	3.25E-09
Benzo(a)anthracene	4.15E-10	0.17	7.05E-11	--	NC	--	NC	--	NC	--	NC
Benzo(a)pyrene	4.15E-09	0.11	4.56E-10	0.08	3.32E-10	0.09	3.73E-10	0.07	2.88E-10	0.21	8.71E-10
Benzo(b)fluoranthene	4.15E-10	0.16	6.63E-11	--	NC	--	NC	--	NC	--	NC
Bis(2-ethylhexyl)phthalate	1.39E-11	1.77	2.46E-11	--	NC	--	NC	--	NC	--	NC
Copper	NC	484.20	NC	--	NC	425.21	NC	--	NC	1437.78	NC
Dibenzo(a,h)anthracene	4.15E-09	0.07	2.90E-10	--	NC	0.07	2.90E-10	--	NC	0.08	3.32E-10
Dieldrin	1.59E-08	0.008	1.27E-10	0.13	2.07E-09	--	NC	--	NC	--	NC
Heptachlor	4.47E-09	--	NC	--	NC	--	NC	--	NC	0.03	1.34E-10
Heptachlor epoxide	9.04E-09	0.01	9.04E-11	--	NC	--	NC	--	NC	0.11	9.94E-10
Pentachlorophenol	1.69E-10	0.99	1.67E-10	--	NC	--	NC	--	NC	--	NC
2,3,7,8-TCDD TEQ	6.62E-05	0.00030	1.98E-08	--	NC	--	NC	--	NC	0.00096	6.35E-08
Total PCBs	1.96E-09	2.78	5.46E-09	0.49	9.62E-10	0.19	3.73E-10	--	NC	5.40	1.06E-08
TOTAL			3.10E-08		8.45E-09		4.65E-09		4.63E-09		7.97E-08

Notes:

EPC - Exposure Point Concentration.

NC - Not Calculated.

-- Not a Compound of Potential Concern in this medium.

(a) - Reference risk is multiplied by the EPC in each area to obtain the potential risk.

SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS

MLE

NONCARCINOGENIC HAZARD INDEX

INCIDENTAL INGESTION AND DERMAL CONTACT

CREEK BOTTOM SOILS

CONSTRUCTION WORKER - MLE

Constituent	Unit Concentration in Soil (mg/kg)	Oral - Soil Absorption Factor	Dermal - Soil Absorption Factor	Oral Reference Dose (mg/kg-day)	Chronic Average Daily Dose-Ing. (mg/kg-day)	Chronic Average Daily Dose-Der. (mg/kg-day)	Hazard Index - Ingestion	Hazard Index - Dermal Contact	Unit Hazard Index
1,4-Dichlorobenzene	1.00E+00	1	0.1	2.40E-03	5.01E-08	1.94E-08	2.09E-05	8.09E-06	2.90E-05
4-Nitroaniline	1.00E+00	1	0.1	3.00E-03	5.01E-08	1.94E-08	1.67E-05	6.47E-06	2.32E-05
Arsenic	1.00E+00	0.3	0.03	3.00E-04	1.50E-08	5.82E-09	5.01E-05	1.94E-05	6.95E-05
Benzo(a)anthracene	1.00E+00	0.29	0.13	NA	1.45E-08	2.52E-08	NA	NA	NC
Benzo(a)pyrene	1.00E+00	0.29	0.13	NA	1.45E-08	2.52E-08	NA	NA	NC
Benzo(b)fluoranthene	1.00E+00	0.29	0.13	NA	1.45E-08	2.52E-08	NA	NA	NC
Bis(2-ethylhexyl)phthalate	1.00E+00	1	0.1	2.00E-02	5.01E-08	1.94E-08	2.50E-06	9.70E-07	3.48E-06
Copper	1.00E+00	1	1	3.70E-02	5.01E-08	1.94E-07	1.35E-06	5.24E-06	6.60E-06
Dibenzo(a,h)anthracene	1.00E+00	0.29	0.13	NA	1.45E-08	2.52E-08	NA	NA	NC
Dieldrin	1.00E+00	1	0.1	5.00E-05	5.01E-08	1.94E-08	1.00E-03	3.88E-04	1.39E-03
Heptachlor	1.00E+00	1	0.1	5.00E-04	5.01E-08	1.94E-08	1.00E-04	3.88E-05	1.39E-04
Heptachlor epoxide	1.00E+00	1	0.1	1.30E-05	5.01E-08	1.94E-08	3.85E-03	1.49E-03	5.35E-03
Pentachlorophenol	1.00E+00	1	0.25	3.00E-02	5.01E-08	4.85E-08	1.67E-06	1.62E-06	3.29E-06
2,3,7,8-TCDD TEQ	1.00E+00	0.5	0.03	1.00E-09	2.50E-08	5.82E-09	2.50E+01	5.82E+00	3.09E+01
Total PCBs	1.00E+00	0.83	0.14	2.00E-05	4.16E-08	2.72E-08	2.08E-03	1.36E-03	3.44E-03

Noncarcinogenic Assessment - Scaling Table
 Risk by Dermal Contact with and Ingestion of Creek Bottom Soils
 MLE Construction Worker
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Compound	Reference HQ (per mg/kg) (a)	Creek Segment B		Creek Segment D		Creek Segment E		Creek Segment F		SITE M	
		EPC (mg/kg)	HQ	EPC (mg/kg)	HQ						
1,4-Dichlorobenzene	2.90E-05	0.29	8.40E-06	--	NC	--	NC	--	NC	0.98	2.84E-05
4-Nitroaniline	2.32E-05	0.76	1.76E-05	--	NC	--	NC	--	NC	--	NC
Arsenic	6.95E-05	9.72	6.76E-04	11.40	7.92E-04	8.08	5.62E-04	9.71	6.75E-04	7.28	5.06E-04
Benzo(a)anthracene	NC	0.17	NC	--	NC	--	NC	--	NC	--	NC
Benzo(a)pyrene	NC	0.11	NC	0.08	NC	0.09	NC	0.07	NC	0.21	NC
Benzo(b)fluoranthene	NC	0.16	NC	--	NC	--	NC	--	NC	--	NC
Bis(2-ethylhexyl)phthalate	3.48E-06	1.77	6.15E-06	--	NC	--	NC	--	NC	--	NC
Copper	6.60E-06	484.20	3.20E-03	--	NC	425.21	2.81E-03	--	NC	1437.78	9.49E-03
Dibenzo(a,h)anthracene	NC	0.07	NC	--	NC	0.07	NC	--	NC	0.08	NC
Dieldrin	1.39E-03	0.01	1.11E-05	0.13	1.81E-04	--	NC	--	NC	--	NC
Heptachlor	1.39E-04	--	NC	--	NC	--	NC	--	NC	0.03	4.17E-06
Heptachlor epoxide	5.35E-03	0.01	5.35E-05	--	NC	--	NC	--	NC	0.11	5.88E-04
Pentachlorophenol	3.29E-06	0.99	3.25E-06	--	NC	--	NC	--	NC	--	NC
2,3,7,8-TCDD TEQ	3.09E+01	0.00030	9.26E-03	--	NC	--	NC	--	NC	0.001	2.96E-02
Total PCBs	3.44E-03	2.78	9.56E-03	0.49	1.68E-03	0.19	6.53E-04	--	NC	5.40	1.86E-02
TOTAL			2.28E-02		2.66E-03		4.02E-03		6.75E-04		5.88E-02

Notes:

EPC - Exposure Point Concentration.

HQ - Hazard Quotient.

NC - Not Calculated.

-- - Not a Compound of Potential Concern in this medium.

(a) - Reference HQ is multiplied by the EPC in each area to obtain the area HQ.

SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS**RME**

Receptors Evaluated	
Receptor 1:	RME Construction Worker

ASSUMPTIONS FOR CONSTRUCTION WORKER - RME INCIDENTIAL INGESTION AND DERMAL CONTACT CREEK BOTTOM SOILS		Assumed Value	Calculated Value
		Units	
Soil Ingestion Rate	RME Construction Worker	330	(mg soil/day)
Adherence Factor	RME Construction Worker	0.30	(mg/cm ²)
Skin Exposed	RME Construction Worker	2479	(cm ²)
Body Weight	RME Construction Worker	70	(kg)
Exposure Frequency	RME Construction Worker	40	(days)/365(days) = 1.10E-01
Exposure Duration (cancer)	RME Construction Worker	1	(years)/70(years) = 1.43E-02
Exposure Duration (noncancer)	RME Construction Worker	1	(yrs)/1(yrs) = 1.00E+00
Lifetime		70	(years)
Unit Conversion Factor		1.00E-06	(kg/mg)

19-Apr-06

SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS

RME

POTENTIAL CARCINOGENIC RISK
 INCIDENTAL INGESTION AND DERMAL CONTACT
 CREEK BOTTOM SOILS
 CONSTRUCTION WORKER - RME

Constituent	Unit Concentration in Soil (mg/kg)	Oral - Soil Absorption Factor	Dermal - Soil Absorption Factor	Oral Cancer Slope Factor (mg/kg-day) ¹	Lifetime Average Daily Dose-Ing. (mg/kg-day)	Lifetime Average Daily Dose-Der. (mg/kg-day)	Lifetime Excess Cancer Risk - Ingestion	Lifetime Excess Cancer Risk - Dermal Contact	Unit Cancer Risk
1,4-Dichlorobenzene	1.00E+00	1	0.1	1.30E-02	7.38E-09	1.66E-09	9.59E-11	2.16E-11	1.18E-10
4-Nitroaniline	1.00E+00	1	0.1	2.10E-02	7.38E-09	1.66E-09	1.55E-10	3.49E-11	1.90E-10
Arsenic	1.00E+00	0.3	0.03	1.50E+00	2.21E-09	4.99E-10	3.32E-09	7.48E-10	4.07E-09
Benzo(a)anthracene	1.00E+00	0.29	0.13	7.30E-01	2.14E-09	2.16E-09	1.56E-09	1.58E-09	3.14E-09
Benzo(a)pyrene	1.00E+00	0.29	0.13	7.30E+00	2.14E-09	2.16E-09	1.56E-08	1.58E-08	3.14E-08
Benzo(b)fluoranthene	1.00E+00	0.29	0.13	7.30E-01	2.14E-09	2.16E-09	1.56E-09	1.58E-09	3.14E-09
Bis(2-ethylhexyl)phthalate	1.00E+00	1	0.1	1.40E-02	7.38E-09	1.66E-09	1.03E-10	2.33E-11	1.27E-10
Copper	1.00E+00	1	1	NA	7.38E-09	1.66E-08	NA	NA	NC
Dibenzo(a,h)anthracene	1.00E+00	0.29	0.13	7.30E+00	2.14E-09	2.16E-09	1.56E-08	1.58E-08	3.14E-08
Dieldrin	1.00E+00	1	0.1	1.60E+01	7.38E-09	1.66E-09	1.18E-07	2.66E-08	1.45E-07
Heptachlor	1.00E+00	1	0.1	4.50E+00	7.38E-09	1.66E-09	3.32E-08	7.48E-09	4.07E-08
Heptachlor epoxide	1.00E+00	1	0.1	9.10E+00	7.38E-09	1.66E-09	6.72E-08	1.51E-08	8.23E-08
Pentachlorophenol	1.00E+00	1	0.25	1.20E-01	7.38E-09	4.16E-09	8.86E-10	4.99E-10	1.38E-09
2,3,7,8-TCDD TEQ	1.00E+00	0.5	0.03	1.50E+05	3.69E-09	4.99E-10	5.54E-04	7.48E-05	6.28E-04
Total PCBs	1.00E+00	0.83	0.14	2.00E+00	6.13E-09	2.33E-09	1.23E-08	4.66E-09	1.69E-08

Carcinogenic Assessment - Scaling Table
 Risk by Dermal Contact with and Ingestion of Creek Bottom Soils
 RME Construction Worker
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Compound	Reference Risk (per mg/kg) (a)	Creek Segment B		Creek Segment D		Creek Segment E		Creek Segment F		SITE M	
		EPC (mg/kg)	Risk	EPC (mg/kg)	Risk						
1,4-Dichlorobenzene	1.18E-10	0.81	9.52E-11	--	NC	--	NC	--	NC	2.49	2.93E-10
4-Nitroaniline	1.90E-10	1.08	2.05E-10	--	NC	--	NC	--	NC	--	NC
Arsenic	4.07E-09	12.34	5.02E-08	15.05	6.12E-08	10.21	4.16E-08	11.38	4.63E-08	12.22	4.97E-08
Benzo(a)anthracene	3.14E-09	0.34	1.07E-09	--	NC	--	NC	--	NC	--	NC
Benzo(a)pyrene	3.14E-08	0.23	7.22E-09	0.13	4.08E-09	0.13	4.08E-09	0.09	2.83E-09	0.45	1.41E-08
Benzo(b)fluoranthene	3.14E-09	0.21	6.60E-10	--	NC	--	NC	--	NC	--	NC
Bis(2-ethylhexyl)phthalate	1.27E-10	8.96	1.13E-09	--	NC	--	NC	--	NC	--	NC
Copper	NC	1006.78	NC	--	NC	864.85	NC	--	NC	3225.79	NC
Dibenzo(a,h)anthracene	3.14E-08	0.08	2.51E-09	--	NC	0.08	2.51E-09	--	NC	0.13	4.08E-09
Dieldrin	1.45E-07	0.030	4.34E-09	0.69	9.98E-08	--	NC	--	NC	--	NC
Heptachlor	4.07E-08	--	NC	--	NC	--	NC	--	NC	0.06	2.44E-09
Heptachlor epoxide	8.23E-08	0.10	8.23E-09	--	NC	--	NC	--	NC	0.70	5.76E-08
Pentachlorophenol	1.38E-09	9.91	1.37E-08	--	NC	--	NC	--	NC	--	NC
2,3,7,8-TCDD TEQ	6.28E-04	0.00175	1.10E-06	--	NC	--	NC	--	NC	0.0020	1.26E-06
Total PCBs	1.69E-08	21.11	3.57E-07	2.20	3.72E-08	0.55	9.30E-09	--	NC	13.07	2.21E-07
TOTAL			1.55E-06		2.02E-07		5.74E-08		4.91E-08		1.61E-06

Notes:
 EPC - Exposure Point Concentration.
 NC - Not Calculated.
 -- Not a Compound of Potential Concern in this medium.
 (a) - Reference risk is multiplied by the EPC in each area to obtain the potential risk.

SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS

RME

NONCARCINOGENIC HAZARD INDEX

INCIDENTAL INGESTION AND DERMAL CONTACT

CREEK BOTTOM SOILS

CONSTRUCTION WORKER - RME

Constituent	Unit Concentration in Soil (mg/kg)	Oral - Soil Absorption Factor	Dermal - Soil Absorption Factor	Oral Reference Dose (mg/kg-day)	Chronic Average Daily Dose-Ing. (mg/kg-day)	Chronic Average Daily Dose-Der. (mg/kg-day)	Hazard Index - Ingestion	Hazard Index - Dermal Contact	Unit Hazard Index
1,4-Dichlorobenzene	1.00E+00	1	0.1	2.40E-03	5.17E-07	1.16E-07	2.15E-04	4.85E-05	2.64E-04
4-Nitroaniline	1.00E+00	1	0.1	3.00E-03	5.17E-07	1.16E-07	1.72E-04	3.88E-05	2.11E-04
Arsenic	1.00E+00	0.3	0.03	3.00E-04	1.55E-07	3.49E-08	5.17E-04	1.16E-04	6.33E-04
Benzo(a)anthracene	1.00E+00	0.29	0.13	NA	1.50E-07	1.51E-07	NA	NA	NC
Benzo(a)pyrene	1.00E+00	0.29	0.13	NA	1.50E-07	1.51E-07	NA	NA	NC
Benzo(b)fluoranthene	1.00E+00	0.29	0.13	NA	1.50E-07	1.51E-07	NA	NA	NC
Bis(2-ethylhexyl)phthalate	1.00E+00	1	0.1	2.00E-02	5.17E-07	1.16E-07	2.58E-05	5.82E-06	3.17E-05
Copper	1.00E+00	1	1	3.70E-02	5.17E-07	1.16E-06	1.40E-05	3.15E-05	4.54E-05
Dibenzo(a,h)anthracene	1.00E+00	0.29	0.13	NA	1.50E-07	1.51E-07	NA	NA	NC
Dieldrin	1.00E+00	1	0.1	5.00E-05	5.17E-07	1.16E-07	1.03E-02	2.33E-03	1.27E-02
Heptachlor	1.00E+00	1	0.1	5.00E-04	5.17E-07	1.16E-07	1.03E-03	2.33E-04	1.27E-03
Heptachlor epoxide	1.00E+00	1	0.1	1.30E-05	5.17E-07	1.16E-07	3.97E-02	8.96E-03	4.87E-02
Pentachlorophenol	1.00E+00	1	0.25	3.00E-02	5.17E-07	2.91E-07	1.72E-05	9.70E-06	2.69E-05
2,3,7,8-TCDD TEQ	1.00E+00	0.5	0.03	1.00E-09	2.58E-07	3.49E-08	2.58E+02	3.49E+01	2.93E+02
Total PCBs	1.00E+00	0.83	0.14	2.00E-05	4.29E-07	1.63E-07	2.14E-02	8.15E-03	2.96E-02

Noncarcinogenic Assessment - Scaling Table
 Risk by Dermal Contact with and Ingestion of Creek Bottom Soils
 RME Construction Worker
 SAUGET AREA 1 EE/CA AND RI/FS - CREEK BOTTOM SOILS
 HUMAN HEALTH RISK ASSESSMENT

Compound	Reference HQ (per mg/kg) (a)	Creek Segment B		Creek Segment D		Creek Segment E		Creek Segment F		SITE M	
		EPC (mg/kg)	HQ	EPC (mg/kg)	HQ						
1,4-Dichlorobenzene	2.64E-04	0.81	2.14E-04	--	NC	--	NC	--	NC	2.49	6.57E-04
4-Nitroaniline	2.11E-04	1.08	2.28E-04	--	NC	--	NC	--	NC	--	NC
Arsenic	6.33E-04	12.34	7.81E-03	15.05	9.53E-03	10.21	6.46E-03	11.38	7.20E-03	12.22	7.74E-03
Benzo(a)anthracene	NC	0.34	NC	--	NC	--	NC	--	NC	--	NC
Benzo(a)pyrene	NC	0.23	NC	0.13	NC	0.13	NC	0.09	NC	0.45	NC
Benzo(b)fluoranthene	NC	0.21	NC	--	NC	--	NC	--	NC	--	NC
Bis(2-ethylhexyl)phthalate	3.17E-05	8.96	2.84E-04	--	NC	--	NC	--	NC	--	NC
Copper	4.54E-05	1006.78	4.57E-02	--	NC	864.85	3.93E-02	--	NC	3225.79	1.47E-01
Dibenzo(a,h)anthracene	NC	0.08	NC	--	NC	0.08	NC	--	NC	0.13	NC
Dieldrin	1.27E-02	0.030	3.80E-04	0.69	8.74E-03	--	NC	--	NC	--	NC
Heptachlor	1.27E-03	--	NC	--	NC	--	NC	--	NC	0.06	7.60E-05
Heptachlor epoxide	4.87E-02	0.10	4.87E-03	--	NC	--	NC	--	NC	0.70	3.41E-02
Pentachlorophenol	2.69E-05	9.91	2.67E-04	--	NC	--	NC	--	NC	--	NC
2,3,7,8-TCDD TEQ	2.93E+02	0.00175	5.13E-01	--	NC	--	NC	--	NC	0.0020	5.86E-01
Total PCBs	2.96E-02	21.11	6.25E-01	2.20	6.51E-02	0.55	1.63E-02	--	NC	13.07	3.87E-01
TOTAL			1.20E+00		8.34E-02		6.20E-02		7.20E-03		1.16E+00

Notes:

EPC - Exposure Point Concentration.

HQ - Hazard Quotient.

NC - Not Calculated.

-- - Not a Compound of Potential Concern in this medium.

(a) - Reference HQ is multiplied by the EPC in each area to obtain the area HQ.

Attachment H

ProUCL UCL Calculation Output Tables

Creek Segment B

Variable: Arsenic

Raw Statistics		
Number of Valid Samples	50	Shapiro-Wilk Test Statistic
Number of Unique Samples	34	Shapiro-Wilk 5% Critical Value
Minimum	2.7	Data not normal at 5% significance level
Maximum	55	
Mean	10.625	95% UCL (Assuming Normal Distribution)
Median	7.4	Student's-t UCL
Standard Deviation	9.578155	
Variance	91.74105	
Coefficient of Variation	0.901473	Gamma Distribution Test
Skewness	3.077386	A-D Test Statistic
Gamma Statistics		
k hat	2.259768	A-D 5% Critical Value
k star (bias corrected)	2.137516	K-S Test Statistic
Theta hat	4.701809	K-S 5% Critical Value
Theta star	4.970724	Data do not follow gamma distribution
nu hat	225.9768	at 5% significance level
nu star	213.7516	
Approx.Chi Square Value (.05)	180.9101	95% UCLs (Assuming Gamma Distribution)
Adjusted Level of Significance	0.0452	Approximate Gamma UCL
Adjusted Chi Square Value	180.0157	Adjusted Gamma UCL
Log-transformed Statistics		
Minimum of log data	0.993252	Lognormal Distribution Test
Maximum of log data	4.007333	Shapiro-Wilk Test Statistic
Mean of log data	2.125924	Shapiro-Wilk 5% Critical Value
Standard Deviation of log data	0.641171	Data are lognormal at 5% significance level
Variance of log data	0.4111	
RECOMMENDATION		
Data are lognormal (0.05)		95% Non-parametric UCLs
Use H-UCL		CLT UCL
		Adj-CLT UCL (Adjusted for skewness)
		Mod-t UCL (Adjusted for skewness)
		Jackknife UCL
		Standard Bootstrap UCL
		Bootstrap-t UCL
		Hall's Bootstrap UCL
		Percentile Bootstrap UCL
		BCA Bootstrap UCL
		95% Chebyshev (Mean, Sd) UCL
		97.5% Chebyshev (Mean, Sd) UCL
		99% Chebyshev (Mean, Sd) UCL

Creek Segment B

Variable: Bis(2-ethylhexyl)phthalate

Raw Statistics		Normal Distribution Test	
Number of Valid Samples	49	Shapiro-Wilk Test Statistic	0.145869
Number of Unique Samples	16	Shapiro-Wilk 5% Critical Value	0.947
Minimum	0.065	Data not normal at 5% significance level	
Maximum	81		
Mean	1.766531	95% UCL (Assuming Normal Distribution)	
Median	0.115	Student's-t UCL	4.535121
Standard Deviation	11.55489		
Variance	133.5155		
Coefficient of Variation	6.541007		
Skewness	6.999985		
Gamma Statistics		Gamma Distribution Test	
k hat	0.269973	A-D Test Statistic	19.46825
k star (bias corrected)	0.267049	A-D 5% Critical Value	0.875724
Theta hat	6.54337	K-S Test Statistic	0.585262
Theta star	6.615003	K-S 5% Critical Value	0.138355
nu hat	26.45732	Data do not follow gamma distribution	
nu star	26.17081	at 5% significance level	
Approx.Chi Square Value (.05)	15.50912	95% UCLs (Assuming Gamma Distribution)	
Adjusted Level of Significance	0.045102	Approximate Gamma UCL	2.980925
Adjusted Chi Square Value	15.25941	Adjusted Gamma UCL	3.029708
Log-transformed Statistics		Lognormal Distribution Test	
Minimum of log data	-2.733368	Shapiro-Wilk Test Statistic	0.24359
Maximum of log data	4.394449	Shapiro-Wilk 5% Critical Value	0.947
Mean of log data	-2.029428	Data not lognormal at 5% significance level	
Standard Deviation of log data	0.945635	95% UCLs (Assuming Lognormal Distribution)	
Variance of log data	0.894226	95% H-UCL	0.279826
		95% Chebyshev (MVUE) UCL	0.341396
		97.5% Chebyshev (MVUE) UCL	0.401337
		99% Chebyshev (MVUE) UCL	0.519078
RECOMMENDATION		95% Non-parametric UCLs	
Data are Non-parametric (0.05)		CLT UCL	4.481688
Use 95% Chebyshev (Mean, Sd) UCL		Adj-CLT UCL (Adjusted for skewness)	6.245479
		Mod-t UCL (Adjusted for skewness)	4.810237
		Jackknife UCL	4.535121
		Standard Bootstrap UCL	4.468148
		Bootstrap-t UCL	1793.145
		Hall's Bootstrap UCL	563.4642
		Percentile Bootstrap UCL	5.068663
		BCA Bootstrap UCL	6.719031
		95% Chebyshev (Mean, Sd) UCL	8.961758
		97.5% Chebyshev (Mean, Sd) UCL	12.07514
		99% Chebyshev (Mean, Sd) UCL	18.19077

Creek Segment B

Variable: 1,4-Dichlorobenzene

Raw Statistics		
Number of Valid Samples	49	Shapiro-Wilk Test Statisticic
Number of Unique Samples	17	Shapiro-Wilk 5% Critical Value
Minimum	0.039	Data not normal at 5% significance level
Maximum	5.5	
Mean	0.293122	95% UCL (Assuming Normal Distribution)
Median	0.115	Student's-t UCL
Standard Deviation	0.834676	
Variance	0.696685	
Coefficient of Variation	2.847535	Gamma Distribution Test
Skewness	5.623878	A-D Test Statistic
Gamma Statistics		
k hat	0.797907	A-D 5% Critical Value
k star (bias corrected)	0.762661	K-S Test Statistic
Theta hat	0.367364	K-S 5% Critical Value
Theta star	0.384342	Data do not follow gamma distribution
nu hat	78.1949	at 5% significance level
nu star	74.74079	95% UCLs (Assuming Gamma Distribution)
Approx.Chi Square Value (.05)	55.82624	Approximate Gamma UCL
Adjusted Level of Significance	0.045102	Adjusted Gamma UCL
Adjusted Chi Square Value	55.33051	
Log-transformed Statistics		
Minimum of log data	-3.244194	Lognormal Distribution Test
Maximum of log data	1.704748	Shapiro-Wilk Test Statisticic
Mean of log data	-1.971233	Shapiro-Wilk 5% Critical Value
Standard Deviation of log data	0.787934	Data not lognormal at 5% significance level
Variance of log data	0.620841	
		95% UCLs (Assuming Lognormal Distribution)
		95% H-UCL
		95% Chebyshev (MVUE) UCL
		97.5% Chebyshev (MVUE) UCL
		99% Chebyshev (MVUE) UCL
RECOMMENDATION		
Data are Non-parametric (0.05)		95% Non-parametric UCLs
Use 95% Chebyshev (Mean, Sd) UCL		CLT UCL
		Adj-CLT UCL (Adjusted for skewness)
		Mod-t UCL (Adjusted for skewness)
		Jackknife UCL
		Standard Bootstrap UCL
		Bootstrap-t UCL
		Hall's Bootstrap UCL
		Percentile Bootstrap UCL
		BCA Bootstrap UCL
		95% Chebyshev (Mean, Sd) UCL
		97.5% Chebyshev (Mean, Sd) UCL
		99% Chebyshev (Mean, Sd) UCL

Creek Segment B

Variable: 4-Nitroaniline

Raw Statistics		Normal Distribution Test	
Number of Valid Samples	49	Shapiro-Wilk Test Statistic	0.175799
Number of Unique Samples	9	Shapiro-Wilk 5% Critical Value	0.947
Minimum	0.495	Data not normal at 5% significance level	
Maximum	9		
Mean	0.758776	95% UCL (Assuming Normal Distribution)	
Median	0.6	Student's-t UCL	1.047059
Standard Deviation	1.203168		
Variance	1.447614		
Coefficient of Variation	1.585671	Gamma Distribution Test	
Skewness	6.976095	A-D Test Statistic	14.13525
Gamma Statistics		A-D 5% Critical Value	0.759004
k hat	2.59273	K-S Test Statistic	0.431078
k star (bias corrected)	2.447597	K-S 5% Critical Value	0.127782
Theta hat	0.292655	Data do not follow gamma distribution	
Theta star	0.310008	at 5% significance level	
nu hat	254.0875	95% UCLs (Assuming Gamma Distribution)	
nu star	239.8645	Approximate Gamma UCL	0.887808
Approx.Chi Square Value (.05)	205.003	Adjusted Gamma UCL	0.892047
Adjusted Level of Significance	0.045102		
Adjusted Chi Square Value	204.0289	Lognormal Distribution Test	
		Shapiro-Wilk Test Statistic	0.31923
		Shapiro-Wilk 5% Critical Value	0.947
		Data not lognormal at 5% significance level	
Log-transformed Statistics			
Minimum of log data	-0.703198	95% UCLs (Assuming Lognormal Distribution)	
Maximum of log data	2.197225	95% H-UCL	0.744276
Mean of log data	-0.48112	95% Chebyshev (MVUE) UCL	0.841277
Standard Deviation of log data	0.401226	97.5% Chebyshev (MVUE) UCL	0.915944
Variance of log data	0.160983	99% Chebyshev (MVUE) UCL	1.062613
		95% Non-parametric UCLs	
		CLT UCL	1.041495
		Adj-CLT UCL (Adjusted for skewness)	1.224525
		Mod-t UCL (Adjusted for skewness)	1.075608
		Jackknife UCL	1.047059
		Standard Bootstrap UCL	1.032522
		Bootstrap-t UCL	5.459558
		Hall's Bootstrap UCL	2.608211
		Percentile Bootstrap UCL	1.101633
		BCA Bootstrap UCL	1.428367
		95% Chebyshev (Mean, Sd) UCL	1.507988
		97.5% Chebyshev (Mean, Sd) UCL	1.832173
		99% Chebyshev (Mean, Sd) UCL	2.468972

RECOMMENDATION

Data are Non-parametric (0.05)

Use Student's-t UCL
or Modified-t UCL

Creek Segment B

Variable: Benzo(a)anthracene

Raw Statistics		
Number of Valid Samples	49	Shapiro-Wilk Test Statisticic
Number of Unique Samples	16	Shapiro-Wilk 5% Critical Value
Minimum	0.051	Data not normal at 5% significance level
Maximum	1.9	
Mean	0.169306	95% UCL (Assuming Normal Distribution)
Median	0.115	Student's-t UCL
Standard Deviation	0.271586	
Variance	0.073759	
Coefficient of Variation	1.604111	Gamma Distribution Test
Skewness	5.88434	A-D Test Statistic
Gamma Statistics		
k hat	1.978381	A-D 5% Critical Value
k star (bias corrected)	1.870861	K-S Test Statistic
Theta hat	0.085578	K-S 5% Critical Value
Theta star	0.090496	Data do not follow gamma distribution
nu hat	193.8814	at 5% significance level
nu star	183.3444	
Approx.Chi Square Value (.05)	153.0182	95% UCLs (Assuming Gamma Distribution)
Adjusted Level of Significance	0.045102	Approximate Gamma UCL
Adjusted Chi Square Value	152.1802	Adjusted Gamma UCL
Log-transformed Statistics		
Minimum of log data	-2.97593	Lognormal Distribution Test
Maximum of log data	0.641854	Shapiro-Wilk Test Statisticic
Mean of log data	-2.049579	Shapiro-Wilk 5% Critical Value
Standard Deviation of log data	0.512895	Data not lognormal at 5% significance level
Variance of log data	0.263062	
		95% UCLs (Assuming Lognormal Distribution)
		95% H-UCL
		95% Chebyshev (MVUE) UCL
		97.5% Chebyshev (MVUE) UCL
		99% Chebyshev (MVUE) UCL
RECOMMENDATION		
Data are Non-parametric (0.05)		95% Non-parametric UCLs
Use 95% Chebyshev (Mean, Sd) UCL		CLT UCL
		Adj-CLT UCL (Adjusted for skewness)
		Mod-t UCL (Adjusted for skewness)
		Jackknife UCL
		Standard Bootstrap UCL
		Bootstrap-t UCL
		Hall's Bootstrap UCL
		Percentile Bootstrap UCL
		BCA Bootstrap UCL
		95% Chebyshev (Mean, Sd) UCL
		97.5% Chebyshev (Mean, Sd) UCL
		99% Chebyshev (Mean, Sd) UCL

Creek Segment B

Variable: Benzo(a)pyrene

Raw Statistics		
Number of Valid Samples	49	Shapiro-Wilk Test Statisticic
Number of Unique Samples	15	Shapiro-Wilk 5% Critical Value
Minimum	0.0425	Data not normal at 5% significance level
Maximum	1.2	
Mean	0.108898	95% UCL (Assuming Normal Distribution)
Median	0.06	Student's-t UCL
Standard Deviation	0.197495	
Variance	0.039004	
Coefficient of Variation	1.81358	Gamma Distribution Test
Skewness	4.770835	A-D Test Statisticic
Gamma Statistics		
k hat	1.391501	A-D 5% Critical Value
k star (bias corrected)	1.319913	K-S Test Statisticic
Theta hat	0.078259	K-S 5% Critical Value
Theta star	0.082504	Data do not follow gamma distribution
nu hat	136.3671	at 5% significance level
nu star	129.3514	
Approx.Chi Square Value (.05)	104.0751	95% UCLs (Assuming Gamma Distribution)
Adjusted Level of Significance	0.045102	Approximate Gamma UCL
Adjusted Chi Square Value	103.3887	Adjusted Gamma UCL
Log-transformed Statistics		
Minimum of log data	-3.158251	Lognormal Distribution Test
Maximum of log data	0.182322	Shapiro-Wilk Test Statisticic
Mean of log data	-2.617862	Shapiro-Wilk 5% Critical Value
Standard Deviation of log data	0.628013	Data not lognormal at 5% significance level
Variance of log data	0.3944	
		95% UCLs (Assuming Lognormal Distribution)
		95% H-UCL
		95% Chebyshev (MVUE) UCL
		97.5% Chebyshev (MVUE) UCL
		99% Chebyshev (MVUE) UCL
RECOMMENDATION		
Data are Non-parametric (0.05)		95% Non-parametric UCLs
Use 95% Chebyshev (Mean, Sd) UCL		CLT UCL
		Adj-CLT UCL (Adjusted for skewness)
		Mod-t UCL (Adjusted for skewness)
		Jackknife UCL
		Standard Bootstrap UCL
		Bootstrap-t UCL
		Hall's Bootstrap UCL
		Percentile Bootstrap UCL
		BCA Bootstrap UCL
		95% Chebyshev (Mean, Sd) UCL
		97.5% Chebyshev (Mean, Sd) UCL
		99% Chebyshev (Mean, Sd) UCL

Creek Segment B

Variable: Benzo(b)fluoranthene

Raw Statistics		
Number of Valid Samples	49	Shapiro-Wilk Test Statisticic
Number of Unique Samples	17	Shapiro-Wilk 5% Critical Value
Minimum	0.053	Data not normal at 5% significance level
Maximum	1.4	
Mean	0.155653	95% UCL (Assuming Normal Distribution)
Median	0.115	Student's-t UCL
Standard Deviation	0.200868	
Variance	0.040348	
Coefficient of Variation	1.290485	Gamma Distribution Test
Skewness	5.584322	A-D Test Statistic
Gamma Statistics		
k hat	2.530207	A-D 5% Critical Value
k star (bias corrected)	2.388902	K-S Test Statistic
Theta hat	0.061518	K-S 5% Critical Value
Theta star	0.065157	Data do not follow gamma distribution
nu hat	247.9603	at 5% significance level
nu star	234.1124	
Approx.Chi Square Value (.05)	199.686	95% UCLs (Assuming Gamma Distribution)
Adjusted Level of Significance	0.045102	Approximate Gamma UCL
Adjusted Chi Square Value	198.725	Adjusted Gamma UCL
Log-transformed Statistics		
Minimum of log data	-2.937463	Lognormal Distribution Test
Maximum of log data	0.336472	Shapiro-Wilk Test Statisticic
Mean of log data	-2.070565	Shapiro-Wilk 5% Critical Value
Standard Deviation of log data	0.474929	Data not lognormal at 5% significance level
Variance of log data	0.225557	
		95% UCLs (Assuming Lognormal Distribution)
		95% H-UCL
		95% Chebyshev (MVUE) UCL
		97.5% Chebyshev (MVUE) UCL
		99% Chebyshev (MVUE) UCL
RECOMMENDATION		
Data are Non-parametric (0.05)		95% Non-parametric UCLs
Use Student's-t UCL		CLT UCL
or Modified-t UCL		Adj-CLT UCL (Adjusted for skewness)
		Mod-t UCL (Adjusted for skewness)
		0.207597
		Jackknife UCL
		Standard Bootstrap UCL
		Bootstrap-t UCL
		Hall's Bootstrap UCL
		Percentile Bootstrap UCL
		BCA Bootstrap UCL
		95% Chebyshev (Mean, Sd) UCL
		97.5% Chebyshev (Mean, Sd) UCL
		99% Chebyshev (Mean, Sd) UCL

Creek Segment B

Variable: Copper

Raw Statistics		
Number of Valid Samples	49	Shapiro-Wilk Test Statistic
Number of Unique Samples	40	Shapiro-Wilk 5% Critical Value
Minimum	6.2	Data not normal at 5% significance level
Maximum	10000	
Mean	484.198	95% UCL (Assuming Normal Distribution)
Median	170	Student's-t UCL
Standard Deviation	1437.671	
Variance	2066898	
Coefficient of Variation	2.96918	Gamma Distribution Test
Skewness	6.316263	A-D Test Statistic
Gamma Statistics		
k hat	0.499519	A-D 5% Critical Value
k star (bias corrected)	0.482542	K-S Test Statistic
Theta hat	969.3275	K-S 5% Critical Value
Theta star	1003.432	Data do not follow gamma distribution
nu hat	48.95291	at 5% significance level
nu star	47.28912	95% UCLs (Assuming Gamma Distribution)
Approx.Chi Square Value (.05)	32.50489	Approximate Gamma UCL
Adjusted Level of Significance	0.045102	Adjusted Gamma UCL
Adjusted Chi Square Value	32.1326	
Log-transformed Statistics		
Minimum of log data	1.824549	Lognormal Distribution Test
Maximum of log data	9.21034	Shapiro-Wilk Test Statistic
Mean of log data	4.910719	Shapiro-Wilk 5% Critical Value
Standard Deviation of log data	1.56203	Data are lognormal at 5% significance level
Variance of log data	2.439937	
		95% UCLs (Assuming Lognormal Distribution)
		95% H-UCL
		95% Chebyshev (MVUE) UCL
		97.5% Chebyshev (MVUE) UCL
		99% Chebyshev (MVUE) UCL
RECOMMENDATION		
Data are lognormal (0.05)		95% Non-parametric UCLs
Use 95% Chebyshev (MVUE) UCL		CLT UCL
		Adj-CLT UCL (Adjusted for skewness)
		Mod-t UCL (Adjusted for skewness)
		Jackknife UCL
		Standard Bootstrap UCL
		Bootstrap-t UCL
		Hall's Bootstrap UCL
		Percentile Bootstrap UCL
		BCA Bootstrap UCL
		95% Chebyshev (Mean, Sd) UCL
		97.5% Chebyshev (Mean, Sd) UCL
		99% Chebyshev (Mean, Sd) UCL

Creek Segment B

Variable: Dibenzo(a,h)anthracene

Raw Statistics		
Number of Valid Samples	49	Shapiro-Wilk Test Statisticic
Number of Unique Samples	11	Shapiro-Wilk 5% Critical Value
Minimum	0.05	Data not normal at 5% significance level
Maximum	0.34	
Mean	0.072041	95% UCL (Assuming Normal Distribution)
Median	0.06	Student's-t UCL
Standard Deviation	0.046566	
Variance	0.002168	
Coefficient of Variation	0.646385	Gamma Distribution Test
Skewness	4.741649	A-D Test Statisticic
Gamma Statistics		
k hat	6.039302	A-D 5% Critical Value
k star (bias corrected)	5.683154	K-S Test Statisticic
Theta hat	0.011929	K-S 5% Critical Value
Theta star	0.012676	Data do not follow gamma distribution
nu hat	591.8516	at 5% significance level
nu star	556.9491	95% UCLs (Assuming Gamma Distribution)
Approx.Chi Square Value (.05)	503.2011	Approximate Gamma UCL
Adjusted Level of Significance	0.045102	Adjusted Gamma UCL
Adjusted Chi Square Value	501.6595	
Log-transformed Statistics		
Minimum of log data	-2.995732	Lognormal Distribution Test
Maximum of log data	-1.07881	Shapiro-Wilk Test Statisticic
Mean of log data	-2.715592	Shapiro-Wilk 5% Critical Value
Standard Deviation of log data	0.336961	Data not lognormal at 5% significance level
Variance of log data	0.113543	
		95% UCLs (Assuming Lognormal Distribution)
		95% H-UCL
		95% Chebyshev (MVUE) UCL
		97.5% Chebyshev (MVUE) UCL
		99% Chebyshev (MVUE) UCL
RECOMMENDATION		
Data are Non-parametric (0.05)		95% Non-parametric UCLs
Use Student's-t UCL		CLT UCL
or Modified-t UCL		Adj-CLT UCL (Adjusted for skewness)
		Mod-t UCL (Adjusted for skewness)
		Jackknife UCL
		Standard Bootstrap UCL
		Bootstrap-t UCL
		Hall's Bootstrap UCL
		Percentile Bootstrap UCL
		BCA Bootstrap UCL
		95% Chebyshev (Mean, Sd) UCL
		97.5% Chebyshev (Mean, Sd) UCL
		99% Chebyshev (Mean, Sd) UCL

Creek Segment B

Variable: Dieldrin

Raw Statistics		
Number of Valid Samples	47	Normal Distribution Test
Number of Unique Samples	29	Shapiro-Wilk Test Statisticic
Minimum	4.20E-04	0.480023
Maximum	0.05	Shapiro-Wilk 5% Critical Value
Mean	0.007716809	0.946
Median	0.0023	Data not normal at 5% significance level
Standard Deviation	0.01362867	
Variance	0.000185741	
Coefficient of Variation	1.766101935	95% UCL (Assuming Normal Distribution)
Skewness	2.390017913	Student's-t UCL
Gamma Statistics		
k hat	0.733200675	Gamma Distribution Test
k star (bias corrected)	0.700585029	A-D Test Statistic
Theta hat	0.010524825	8.973714
Theta star	0.011014806	A-D 5% Critical Value
nu hat	68.92086342	0.792679
nu star	65.8549927	K-S Test Statistic
Approx.Chi Square Value (.05)	48.17791182	0.403434
Adjusted Level of Significance	0.044893617	K-S 5% Critical Value
Adjusted Chi Square Value	47.69888522	0.134516
Log-transformed Statistics		
Minimum of log data	-7.775255847	Data do not follow gamma distribution
Maximum of log data	-2.995732274	at 5% significance level
Mean of log data	-5.683345519	
Standard Deviation of log data	1.077770991	95% UCLs (Assuming Gamma Distribution)
Variance of log data	1.161590308	Approximate Gamma UCL
		0.010548
		Adjusted Gamma UCL
		0.010654
RECOMMENDATION		
Data are Non-parametric (0.05)		Lognormal Distribution Test
Use 99% Chebyshev (Mean, Sd) UCL		Shapiro-Wilk Test Statisticic
		0.703713
		Shapiro-Wilk 5% Critical Value
		0.946
		Data not lognormal at 5% significance level
		95% Non-parametric UCLs
		CLT UCL
		0.010987
		Adj-CLT UCL (Adjusted for skewness)
		0.011727
		Mod-t UCL (Adjusted for skewness)
		0.011169
		Jackknife UCL
		0.011054
		Standard Bootstrap UCL
		0.010858
		Bootstrap-t UCL
		0.012671
		Hall's Bootstrap UCL
		0.010871
		Percentile Bootstrap UCL
		0.011034
		BCA Bootstrap UCL
		0.011862
		95% Chebyshev (Mean, Sd) UCL
		0.016382
		97.5% Chebyshev (Mean, Sd) UCL
		0.020132
		99% Chebyshev (Mean, Sd) UCL
		0.027497

Creek Segment B

Variable: Dioxin TEQ-HH

Raw Statistics		
Number of Valid Samples	47	Shapiro-Wilk Test Statisticic
Number of Unique Samples	47	Shapiro-Wilk 5% Critical Value
Minimum	8.38E-06	Data not normal at 5% significance level
Maximum	6.64E-03	
Mean	2.95E-04	95% UCL (Assuming Normal Distribution)
Median	6.36E-05	Student's-t UCL
Standard Deviation	1.01E-03	5.42E-04
Variance	1.01E-06	
Coefficient of Variation	3.405419349	Gamma Distribution Test
Skewness	5.802447529	A-D Test Statistic
Gamma Statistics		
k hat	0.443397956	6.665534
k star (bias corrected)	0.429280356	0.827442
Theta hat	6.66E-04	0.355261
Theta star	6.88E-04	0.137626
nu hat	41.67940783	Data do not follow gamma distribution
nu star	40.35235343	at 5% significance level
Approx.Chi Square Value (.05)	26.79428544	95% UCLs (Assuming Gamma Distribution)
Adjusted Level of Significance	0.044893617	Approximate Gamma UCL
Adjusted Chi Square Value	26.44368672	4.45E-04
Log-transformed Statistics		
Minimum of log data	-11.68918543	Adjusted Gamma UCL
Maximum of log data	-5.013935735	4.51E-04
Mean of log data	-9.587339586	
Standard Deviation of log data	1.325275284	95% UCLs (Assuming Lognormal Distribution)
Variance of log data	1.756354577	95% H-UCL
RECOMMENDATION		
Data are Non-parametric (0.05)		2.80E-04
Use 99% Chebyshev (Mean, Sd) UCL		3.30E-04
		4.04E-04
		5.49E-04
95% Non-parametric UCLs		
	CLT UCL	5.37E-04
	Adj-CLT UCL (Adjusted for skewness)	0.000669
	Mod-t UCL (Adjusted for skewness)	0.000562
	Jackknife UCL	5.42E-04
	Standard Bootstrap UCL	5.35E-04
	Bootstrap-t UCL	0.001154
	Hall's Bootstrap UCL	0.001256
	Percentile Bootstrap UCL	5.70E-04
	BCA Bootstrap UCL	7.60E-04
	95% Chebyshev (Mean, Sd) UCL	9.35E-04
	97.5% Chebyshev (Mean, Sd) UCL	1.21E-03
	99% Chebyshev (Mean, Sd) UCL	1.75E-03

Creek Segment B

Variable: Heptachlor epoxide

Raw Statistics		
Number of Valid Samples	49	Shapiro-Wilk Test Statisticic
Number of Unique Samples	28	Shapiro-Wilk 5% Critical Value
Minimum	0.0002	Data not normal at 5% significance level
Maximum	0.41	
Mean	0.014289	95% UCL (Assuming Normal Distribution)
Median	0.0012	Student's-t UCL
Standard Deviation	0.059574	
Variance	0.003549	
Coefficient of Variation	4.169142	Gamma Distribution Test
Skewness	6.411323	A-D Test Statistic
Gamma Statistics		
k hat	0.362738	A-D 5% Critical Value
k star (bias corrected)	0.354135	K-S Test Statistic
Theta hat	0.039393	K-S 5% Critical Value
Theta star	0.04035	Data do not follow gamma distribution
nu hat	35.54836	at 5% significance level
nu star	34.70526	95% UCLs (Assuming Gamma Distribution)
Approx.Chi Square Value (.05)	22.2266	Approximate Gamma UCL
Adjusted Level of Significance	0.045102	Adjusted Gamma UCL
Adjusted Chi Square Value	21.92298	
Log-transformed Statistics		
Minimum of log data	-8.517193	Lognormal Distribution Test
Maximum of log data	-0.891598	Shapiro-Wilk Test Statisticic
Mean of log data	-6.091281	Shapiro-Wilk 5% Critical Value
Standard Deviation of log data	1.427323	Data not lognormal at 5% significance level
Variance of log data	2.03725	
		95% UCLs (Assuming Lognormal Distribution)
		95% H-UCL
		95% Chebyshev (MVUE) UCL
		97.5% Chebyshev (MVUE) UCL
		99% Chebyshev (MVUE) UCL
RECOMMENDATION		
Data are Non-parametric (0.05)		95% Non-parametric UCLs
Use 99% Chebyshev (Mean, Sd) UCL		CLT UCL
		Adj-CLT UCL (Adjusted for skewness)
		Mod-t UCL (Adjusted for skewness)
		Jackknife UCL
		Standard Bootstrap UCL
		Bootstrap-t UCL
		Hall's Bootstrap UCL
		Percentile Bootstrap UCL
		BCA Bootstrap UCL
		95% Chebyshev (Mean, Sd) UCL
		97.5% Chebyshev (Mean, Sd) UCL
		99% Chebyshev (Mean, Sd) UCL

Creek Segment B

Variable: Pentachlorophenol

Raw Statistics		
Number of Valid Samples	49	Shapiro-Wilk Test Statisticic
Number of Unique Samples	37	Shapiro-Wilk 5% Critical Value
Minimum	0.0019	Data not normal at 5% significance level
Maximum	44	
Mean	0.987422	95% UCL (Assuming Normal Distribution)
Median	0.012	Student's-t UCL
Standard Deviation	6.280036	
Variance	39.43886	
Coefficient of Variation	6.36003	Gamma Distribution Test
Skewness	6.974926	A-D Test Statisticic
Gamma Statistics		
k hat	0.186841	A-D 5% Critical Value
k star (bias corrected)	0.189007	K-S Test Statisticic
Theta hat	5.284826	K-S 5% Critical Value
Theta star	5.224257	Data do not follow gamma distribution
nu hat	18.31042	at 5% significance level
nu star	18.52271	95% UCLs (Assuming Gamma Distribution)
Approx.Chi Square Value (.05)	9.768272	Approximate Gamma UCL
Adjusted Level of Significance	0.045102	Adjusted Gamma UCL
Adjusted Chi Square Value	9.574799	
Log-transformed Statistics		
Minimum of log data	-6.265901	Lognormal Distribution Test
Maximum of log data	3.78419	Shapiro-Wilk Test Statisticic
Mean of log data	-3.99315	Shapiro-Wilk 5% Critical Value
Standard Deviation of log data	1.878793	Data not lognormal at 5% significance level
Variance of log data	3.529865	
		95% UCLs (Assuming Lognormal Distribution)
		95% H-UCL
		95% Chebyshev (MVUE) UCL
		97.5% Chebyshev (MVUE) UCL
		99% Chebyshev (MVUE) UCL
RECOMMENDATION		
Data are Non-parametric (0.05)		95% Non-parametric UCLs
Use 99% Chebyshev (Mean, Sd) UCL		CLT UCL
		Adj-CLT UCL (Adjusted for skewness)
		Mod-t UCL (Adjusted for skewness)
		Jackknife UCL
		Standard Bootstrap UCL
		Bootstrap-t UCL
		Hall's Bootstrap UCL
		Percentile Bootstrap UCL
		BCA Bootstrap UCL
		95% Chebyshev (Mean, Sd) UCL
		97.5% Chebyshev (Mean, Sd) UCL
		99% Chebyshev (Mean, Sd) UCL

Creek Segment B

Variable: Total PCBs

Raw Statistics		
Number of Valid Samples	49	Shapiro-Wilk Test Statisticic
Number of Unique Samples	47	Shapiro-Wilk 5% Critical Value
Minimum	0.0467	Data not normal at 5% significance level
Maximum	86.06	
Mean	2.77577	95% UCL (Assuming Normal Distribution)
Median	0.0959	Student's-t UCL
Standard Deviation	12.90127	
Variance	166.4428	
Coefficient of Variation	4.647817	Gamma Distribution Test
Skewness	6.034668	A-D Test Statistic
Gamma Statistics		
k hat	0.256706	A-D 5% Critical Value
k star (bias corrected)	0.254595	K-S Test Statistic
Theta hat	10.81302	K-S 5% Critical Value
Theta star	10.90268	Data do not follow gamma distribution
nu hat	25.15722	at 5% significance level
nu star	24.95032	
Approx.Chi Square Value (.05)	14.57184	95% UCLs (Assuming Gamma Distribution)
Adjusted Level of Significance	0.045102	Approximate Gamma UCL
Adjusted Chi Square Value	14.3305	Adjusted Gamma UCL
Log-transformed Statistics		
Minimum of log data	-3.064011	Lognormal Distribution Test
Maximum of log data	4.455045	Shapiro-Wilk Test Statisticic
Mean of log data	-1.734204	Shapiro-Wilk 5% Critical Value
Standard Deviation of log data	1.665093	Data not lognormal at 5% significance level
Variance of log data	2.772535	
		95% UCLs (Assuming Lognormal Distribution)
		95% H-UCL
		95% Chebyshev (MVUE) UCL
		97.5% Chebyshev (MVUE) UCL
		99% Chebyshev (MVUE) UCL
RECOMMENDATION		
Data are Non-parametric (0.05)		95% Non-parametric UCLs
Use 99% Chebyshev (Mean, Sd) UCL		CLT UCL
		Adj-CLT UCL (Adjusted for skewness)
		Mod-t UCL (Adjusted for skewness)
		Jackknife UCL
		Standard Bootstrap UCL
		Bootstrap-t UCL
		Hall's Bootstrap UCL
		Percentile Bootstrap UCL
		BCA Bootstrap UCL
		95% Chebyshev (Mean, Sd) UCL
		97.5% Chebyshev (Mean, Sd) UCL
		99% Chebyshev (Mean, Sd) UCL

Data File

Variable: B:PCB_POST_EX

Raw Statistics			
Number of Valid Samples	29	Shapiro-Wilk Test Statistic	0.741137
Number of Unique Samples	26	Shapiro-Wilk 5% Critical Value	0.926
Minimum	0.0055	Data not normal at 5% significance level	
Maximum	0.3213		
Mean	0.082967	95% UCL (Assuming Normal Distribution)	
Median	0.0399	Student's-t UCL	0.109725
Standard Deviation	0.084704		
Variance	0.007175		
Coefficient of Variation	1.020933	Gamma Distribution Test	
Skewness	1.763212	A-D Test Statistic	1.248823
Gamma Statistics			
k hat	1.297721	A-D 5% Critical Value	0.76733
k star (bias corrected)	1.186462	K-S Test Statistic	0.18519
Theta hat	0.063933	K-S 5% Critical Value	0.166303
Theta star	0.069928	Data do not follow gamma distribution	
nu hat	75.26779	at 5% significance level	
nu star	68.8148	95% UCLs (Assuming Gamma Distribution)	
Approx.Chi Square Value (.05)	50.71669	Approximate Gamma UCL	0.112574
Adjusted Level of Significance	0.0407	Adjusted Gamma UCL	0.114673
Adjusted Chi Square Value	49.78816	Lognormal Distribution Test	
Log-transformed Statistics			
Minimum of log data	-5.203007	Shapiro-Wilk Test Statistic	0.923959
Maximum of log data	-1.13538	Shapiro-Wilk 5% Critical Value	0.926
Mean of log data	-2.921698	Data not lognormal at 5% significance level	
Standard Deviation of log data	0.969372	95% UCLs (Assuming Lognormal Distribution)	
Variance of log data	0.939683	95% H-UCL	0.13406
		95% Chebyshev (MVUE) UCL	0.159474
		97.5% Chebyshev (MVUE) UCL	0.192049
		99% Chebyshev (MVUE) UCL	0.256036
RECOMMENDATION			
Data are Non-parametric (0.05)		95% Non-parametric UCLs	
Use 95% Chebyshev (Mean, Sd) UCL		CLT UCL	0.108839
		Adj-CLT UCL (Adjusted for skewness)	0.114342
		Mod-t UCL (Adjusted for skewness)	0.110583
		Jackknife UCL	0.109725
		Standard Bootstrap UCL	0.108022
		Bootstrap-t UCL	0.118696
		Hall's Bootstrap UCL	0.112834
		Percentile Bootstrap UCL	0.109979
		BCA Bootstrap UCL	0.11454
		95% Chebyshev (Mean, Sd) UCL	0.151529
		97.5% Chebyshev (Mean, Sd) UCL	0.181196
		99% Chebyshev (Mean, Sd) UCL	0.23947

Creek Segment D

Variable: Arsenic

Raw Statistics			
Number of Valid Samples	6	Shapiro-Wilk Test Statistic	0.968942
Number of Unique Samples	6	Shapiro-Wilk 5% Critical Value	0.788
Minimum	5.7	Data are normal at 5% significance level	
Maximum	18		
Mean	11.4	95% UCL (Assuming Normal Distribution)	
Median	10.5	Student's-t UCL	15.04978
Standard Deviation	4.436665		
Variance	19.684	Gamma Distribution Test	
Coefficient of Variation	0.389181	A-D Test Statistic	0.186201
Skewness	0.434442	A-D 5% Critical Value	0.6982
Gamma Statistics			
k hat	7.681871	K-S Test Statistic	0.157668
k star (bias corrected)	3.952046	K-S 5% Critical Value	0.332624
Theta hat	1.484014	Data follow gamma distribution	
Theta star	2.884581	at 5% significance level	
nu hat	92.18245	95% UCLs (Assuming Gamma Distribution)	
nu star	47.42456	Approximate Gamma UCL	16.57524
Approx.Chi Square Value (.05)	32.61732	Adjusted Gamma UCL	19.13455
Adjusted Level of Significance	0.01222	Lognormal Distribution Test	
Adjusted Chi Square Value	28.25464	Shapiro-Wilk Test Statistic	0.978157
Log-transformed Statistics			
Minimum of log data	1.740466	Shapiro-Wilk 5% Critical Value	0.788
Maximum of log data	2.890372	Data are lognormal at 5% significance level	
Mean of log data	2.367115	95% UCLs (Assuming Lognormal Distribution)	
Standard Deviation of log data	0.407275	95% H-UCL	18.21503
Variance of log data	0.165873	95% Chebyshev (MVUE) UCL	19.6954
RECOMMENDATION			
Data are normal (0.05)		97.5% Chebyshev (MVUE) UCL	23.27521
Use Student's-t UCL		99% Chebyshev (MVUE) UCL	30.30705
95% Non-parametric UCLs			
		CLT UCL	14.37926
		Adj-CLT UCL (Adjusted for skewness)	14.72252
		Mod-t UCL (Adjusted for skewness)	15.10332
		Jackknife UCL	15.04978
		Standard Bootstrap UCL	14.14789
		Bootstrap-t UCL	16.8748
		Hall's Bootstrap UCL	20.39105
		Percentile Bootstrap UCL	14.11667
		BCA Bootstrap UCL	14.28333
		95% Chebyshev (Mean, Sd) UCL	19.2951
		97.5% Chebyshev (Mean, Sd) UCL	22.71132
		99% Chebyshev (Mean, Sd) UCL	29.42182

Creek Segment D

Variable: Benzo(a)pyrene

Raw Statistics		
Number of Valid Samples	6	Shapiro-Wilk Test Statisticic
Number of Unique Samples	5	Shapiro-Wilk 5% Critical Value
Minimum	0.049	Data not normal at 5% significance level
Maximum	0.14	
Mean	0.084833	95% UCL (Assuming Normal Distribution)
Median	0.065	Student's-t UCL
Standard Deviation	0.039423	
Variance	0.001554	
Coefficient of Variation	0.46471	
Skewness	0.896548	
Gamma Statistics		
k hat	6.161686	
k star (bias corrected)	3.191954	Data follow approximate gamma distibution at 5% significance level
Theta hat	0.013768	
Theta star	0.026577	95% UCLs (Assuming Gamma Distribution)
nu hat	73.94023	Approximate Gamma UCL
nu star	38.30345	0.129316
Approx.Chi Square Value (.05)	25.12761	Adjusted Gamma UCL
Adjusted Level of Significance	0.01222	0.15215
Adjusted Chi Square Value	21.35656	
Log-transformed Statistics		
Minimum of log data	-3.015935	
Maximum of log data	-1.966113	95% UCLs (Assuming Lognormal Distribution)
Mean of log data	-2.550403	95% H-UCL
Standard Deviation of log data	0.436927	95% Chebyshev (MVUE) UCL
Variance of log data	0.190905	97.5% Chebyshev (MVUE) UCL
		99% Chebyshev (MVUE) UCL
RECOMMENDATION		
Assuming gamma distribution (0.05)		95% Non-parametric UCLs
Use Approximate Gamma UCL		CLT UCL
		0.111306
		Adj-CLT UCL (Adjusted for skewness)
		0.117601
		Mod-t UCL (Adjusted for skewness)
		0.118246
		Jackknife UCL
		0.117264
		Standard Bootstrap UCL
		0.108822
		Bootstrap-t UCL
		0.229324
		Hall's Bootstrap UCL
		0.447346
		Percentile Bootstrap UCL
		0.110667
		BCA Bootstrap UCL
		0.11
		95% Chebyshev (Mean, Sd) UCL
		0.154987
		97.5% Chebyshev (Mean, Sd) UCL
		0.185342
		99% Chebyshev (Mean, Sd) UCL
		0.24497

Creek Segment D

Variable: Dieldrin

Raw Statistics		
Number of Valid Samples	6	Shapiro-Wilk Test Statisticic
Number of Unique Samples	6	Shapiro-Wilk 5% Critical Value
Minimum	0.0013	Data not normal at 5% significance level
Maximum	0.69	
Mean	0.127433	95% UCL (Assuming Normal Distribution)
Median	0.0081	Student's-t UCL
Standard Deviation	0.276368	
Variance	0.076379	
Coefficient of Variation	2.168726	Gamma Distribution Test
Skewness	2.419787	A-D Test Statistic
Gamma Statistics		
k hat	0.29417	A-D 5% Critical Value
k star (bias corrected)	0.258196	K-S Test Statistic
Theta hat	0.433196	K-S 5% Critical Value
Theta star	0.493552	Data follow gamma distribution
nu hat	3.530042	at 5% significance level
nu star	3.098354	95% UCLs (Assuming Gamma Distribution)
Approx.Chi Square Value (.05)	0.401956	Approximate Gamma UCL
Adjusted Level of Significance	0.01222	Adjusted Gamma UCL
Adjusted Chi Square Value	0.180986	
Log-transformed Statistics		
Minimum of log data	-6.645391	Lognormal Distribution Test
Maximum of log data	-0.371064	Shapiro-Wilk Test Statisticic
Mean of log data	-4.411782	Shapiro-Wilk 5% Critical Value
Standard Deviation of log data	2.433654	Data are lognormal at 5% significance level
Variance of log data	5.92267	
		95% UCLs (Assuming Lognormal Distribution)
		95% H-UCL
		95% Chebyshev (MVUE) UCL
		97.5% Chebyshev (MVUE) UCL
		99% Chebyshev (MVUE) UCL
RECOMMENDATION		
Data follow gamma distribution (0.05)		95% Non-parametric UCLs
Use Adjusted Gamma UCL		CLT UCL
		Adj-CLT UCL (Adjusted for skewness)
		Mod-t UCL (Adjusted for skewness)
		Jackknife UCL
		Standard Bootstrap UCL
		Bootstrap-t UCL
		Hall's Bootstrap UCL
		Percentile Bootstrap UCL
		BCA Bootstrap UCL
		95% Chebyshev (Mean, Sd) UCL
		97.5% Chebyshev (Mean, Sd) UCL
		99% Chebyshev (Mean, Sd) UCL

Recommended UCL exceeds the maximum observation

Creek Segment D

Variable: Total PCBs		
Raw Statistics		
Number of Valid Samples	6	Shapiro-Wilk Test Statisticic
Number of Unique Samples	6	Shapiro-Wilk 5% Critical Value
Minimum	0.0454	Data not normal at 5% significance level
Maximum	2.4396	
Mean	0.491517	95% UCL (Assuming Normal Distribution)
Median	0.0594	Student's-t UCL
Standard Deviation	0.959088	
Variance	0.919849	
Coefficient of Variation	1.951282	Gamma Distribution Test
Skewness	2.397669	A-D Test Statistic
Gamma Statistics		
k hat	0.493096	A-D 5% Critical Value
k star (bias corrected)	0.357659	K-S Test Statistic
Theta hat	0.996797	K-S 5% Critical Value
Theta star	1.37426	Data do not follow gamma distribution
nu hat	5.917155	at 5% significance level
nu star	4.291911	95% UCLs (Assuming Gamma Distribution)
Approx.Chi Square Value (.05)	0.839978	Approximate Gamma UCL
Adjusted Level of Significance	0.01222	Adjusted Gamma UCL
Adjusted Chi Square Value	0.422091	
Log-transformed Statistics		
Minimum of log data	-3.092243	Lognormal Distribution Test
Maximum of log data	0.891834	Shapiro-Wilk Test Statisticic
Mean of log data	-2.001194	Shapiro-Wilk 5% Critical Value
Standard Deviation of log data	1.572498	Data not lognormal at 5% significance level
Variance of log data	2.47275	95% UCLs (Assuming Lognormal Distribution)
		95% H-UCL
		95% Chebyshev (MVUE) UCL
		97.5% Chebyshev (MVUE) UCL
		99% Chebyshev (MVUE) UCL
RECOMMENDATION		
Data are Non-parametric (0.05)		95% Non-parametric UCLs
Use 99% Chebyshev (Mean, Sd) UCL		CLT UCL
		Adj-CLT UCL (Adjusted for skewness)
		Mod-t UCL (Adjusted for skewness)
		Jackknife UCL
		Standard Bootstrap UCL
		Bootstrap-t UCL
		Hall's Bootstrap UCL
		Percentile Bootstrap UCL
		BCA Bootstrap UCL
		95% Chebyshev (Mean, Sd) UCL
		97.5% Chebyshev (Mean, Sd) UCL
		99% Chebyshev (Mean, Sd) UCL

Recommended UCL exceeds the maximum observation
Consider using 95% or 97.5% Chebyshev (Mean, Sd) UCL

Creek Segment E

Variable: Arsenic

Raw Statistics		
Number of Valid Samples	17	Shapiro-Wilk Test Statistic
Number of Unique Samples	14	Shapiro-Wilk 5% Critical Value
Minimum	1.7	Data not normal at 5% significance level
Maximum	20	
Mean	8.082353	95% UCL (Assuming Normal Distribution)
Median	7.1	Student's-t UCL
Standard Deviation	4.202713	
Variance	17.66279	
Coefficient of Variation	0.519986	Gamma Distribution Test
Skewness	1.415861	A-D Test Statistic
Gamma Statistics		
k hat	3.982047	A-D 5% Critical Value
k star (bias corrected)	3.318549	K-S Test Statistic
Theta hat	2.029698	K-S 5% Critical Value
Theta star	2.435508	Data follow gamma distribution
nu hat	135.3896	at 5% significance level
nu star	112.8307	95% UCLs (Assuming Gamma Distribution)
Approx.Chi Square Value (.05)	89.30514	Approximate Gamma UCL
Adjusted Level of Significance	0.03461	10.21147
Adjusted Chi Square Value	87.11291	Adjusted Gamma UCL
Log-transformed Statistics		
Minimum of log data	0.530628	Lognormal Distribution Test
Maximum of log data	2.995732	Shapiro-Wilk Test Statistic
Mean of log data	1.958896	0.898907
Standard Deviation of log data	0.55901	Shapiro-Wilk 5% Critical Value
Variance of log data	0.312492	0.892
Data are lognormal at 5% significance level		
95% UCLs (Assuming Lognormal Distribution)		
95% H-UCL		11.12403
95% Chebyshev (MVUE) UCL		13.25061
97.5% Chebyshev (MVUE) UCL		15.43374
99% Chebyshev (MVUE) UCL		19.72208
95% Non-parametric UCLs		
CLT UCL		9.758965
Adj-CLT UCL (Adjusted for skewness)		10.13297
Mod-t UCL (Adjusted for skewness)		9.920283
Jackknife UCL		9.861945
Standard Bootstrap UCL		9.718937
Bootstrap-t UCL		10.50866
Hall's Bootstrap UCL		12.01791
Percentile Bootstrap UCL		9.823529
BCA Bootstrap UCL		10.07647
95% Chebyshev (Mean, Sd) UCL		12.52541
97.5% Chebyshev (Mean, Sd) UCL		14.44793
99% Chebyshev (Mean, Sd) UCL		18.22434
RECOMMENDATION		
Data follow gamma distribution (0.05)		
Use Approximate Gamma UCL		

Creek Segment E

Variable: Benzo(a)pyrene

Raw Statistics		
Number of Valid Samples	17	Shapiro-Wilk Test Statisticic
Number of Unique Samples	7	Shapiro-Wilk 5% Critical Value
Minimum	0.0575	Data not normal at 5% significance level
Maximum	0.42	
Mean	0.089676	95% UCL (Assuming Normal Distribution)
Median	0.065	Student's-t UCL
Standard Deviation	0.087161	
Variance	0.007597	
Coefficient of Variation	0.971953	Gamma Distribution Test
Skewness	3.840953	A-D Test Statistic
Gamma Statistics		
k hat	2.961339	A-D 5% Critical Value
k star (bias corrected)	2.477965	K-S Test Statistic
Theta hat	0.030282	K-S 5% Critical Value
Theta star	0.03619	Data do not follow gamma distribution
nu hat	100.6855	at 5% significance level
nu star	84.25082	
Approx.Chi Square Value (.05)	64.09134	95% UCLs (Assuming Gamma Distribution)
Adjusted Level of Significance	0.03461	Approximate Gamma UCL
Adjusted Chi Square Value	62.24991	Adjusted Gamma UCL
Log-transformed Statistics		
Minimum of log data	-2.85597	Lognormal Distribution Test
Maximum of log data	-0.867501	Shapiro-Wilk Test Statisticic
Mean of log data	-2.589789	Shapiro-Wilk 5% Critical Value
Standard Deviation of log data	0.486171	Data not lognormal at 5% significance level
Variance of log data	0.236362	
		95% UCLs (Assuming Lognormal Distribution)
		95% H-UCL
		95% Chebyshev (MVUE) UCL
		97.5% Chebyshev (MVUE) UCL
		99% Chebyshev (MVUE) UCL
RECOMMENDATION		
Data are Non-parametric (0.05)		95% Non-parametric UCLs
Use Student's-t UCL		CLT UCL
or Modified-t UCL		Adj-CLT UCL (Adjusted for skewness)
		Mod-t UCL (Adjusted for skewness)
		Jackknife UCL
		Standard Bootstrap UCL
		Bootstrap-t UCL
		Hall's Bootstrap UCL
		Percentile Bootstrap UCL
		BCA Bootstrap UCL
		95% Chebyshev (Mean, Sd) UCL
		97.5% Chebyshev (Mean, Sd) UCL
		99% Chebyshev (Mean, Sd) UCL

Creek Segment E

Variable: Copper

Raw Statistics		
Number of Valid Samples	17	Shapiro-Wilk Test Statisticic
Number of Unique Samples	17	Shapiro-Wilk 5% Critical Value
Minimum	24.5	Data not normal at 5% significance level
Maximum	4300	
Mean	425.2059	95% UCL (Assuming Normal Distribution)
Median	94	Student's-t UCL
Standard Deviation	1011.95	
Variance	1024043	
Coefficient of Variation	2.379906	Gamma Distribution Test
Skewness	3.943236	A-D Test Statisticic
Gamma Statistics		
k hat	0.557621	A-D 5% Critical Value
k star (bias corrected)	0.498433	K-S Test Statisticic
Theta hat	762.5352	K-S 5% Critical Value
Theta star	853.0849	Data do not follow gamma distribution
nu hat	18.95913	at 5% significance level
nu star	16.94673	95% UCLs (Assuming Gamma Distribution)
Approx.Chi Square Value (.05)	8.632863	Approximate Gamma UCL
Adjusted Level of Significance	0.03461	Adjusted Gamma UCL
Adjusted Chi Square Value	8.0162	
Log-transformed Statistics		
Minimum of log data	3.198673	Lognormal Distribution Test
Maximum of log data	8.36637	Shapiro-Wilk Test Statisticic
Mean of log data	4.932339	Shapiro-Wilk 5% Critical Value
Standard Deviation of log data	1.372319	Data are lognormal at 5% significance level
Variance of log data	1.883261	
RECOMMENDATION		
Data are lognormal (0.05)		
Use 95% Chebyshev (MVUE) UCL		
95% Non-parametric UCLs		
	CLT UCL	828.9088
	Adj-CLT UCL (Adjusted for skewness)	1079.718
	Mod-t UCL (Adjusted for skewness)	892.8262
	Jackknife UCL	853.705
	Standard Bootstrap UCL	809.2038
	Bootstrap-t UCL	2458.582
	Hall's Bootstrap UCL	2360.057
	Percentile Bootstrap UCL	902.5882
	BCA Bootstrap UCL	1179.029
	95% Chebyshev (Mean, Sd) UCL	1495.028
	97.5% Chebyshev (Mean, Sd) UCL	1957.941
	99% Chebyshev (Mean, Sd) UCL	2867.243

Creek Segment E

Variable: Dibenzo(a,h)anthracene

Raw Statistics		
Number of Valid Samples	17	Shapiro-Wilk Test Statisticic
Number of Unique Samples	6	Shapiro-Wilk 5% Critical Value
Minimum	0.0575	Data not normal at 5% significance level
Maximum	0.14	
Mean	0.069265	95% UCL (Assuming Normal Distribution)
Median	0.065	Student's-t UCL
Standard Deviation	0.018952	
Variance	0.000359	
Coefficient of Variation	0.273622	Gamma Distribution Test
Skewness	3.63901	A-D Test Statisticic
Gamma Statistics		
k hat	21.41628	2.866712
k star (bias corrected)	17.67616	0.737785
Theta hat	0.003234	0.351195
Theta star	0.003919	0.208669
nu hat	728.1537	Data do not follow gamma distribution
nu star	600.9893	at 5% significance level
Approx.Chi Square Value (.05)	545.1108	95% UCLs (Assuming Gamma Distribution)
Adjusted Level of Significance	0.03461	Approximate Gamma UCL
Adjusted Chi Square Value	539.5377	0.076365
Log-transformed Statistics		
Minimum of log data	-2.85597	Adjusted Gamma UCL
Maximum of log data	-1.966113	0.077154
Mean of log data	-2.693348	Lognormal Distribution Test
Standard Deviation of log data	0.202517	Shapiro-Wilk Test Statisticic
Variance of log data	0.041013	0.582462
		Shapiro-Wilk 5% Critical Value
		0.892
		Data not lognormal at 5% significance level
		95% Non-parametric UCLs
		95% UCLs (Assuming Lognormal Distribution)
		CLT UCL
		0.076825
		Adj-CLT UCL (Adjusted for skewness)
		0.08116
		Mod-t UCL (Adjusted for skewness)
		0.077966
		Jackknife UCL
		0.07729
		Standard Bootstrap UCL
		0.076668
		Bootstrap-t UCL
		0.10018
		Hall's Bootstrap UCL
		0.110982
		Percentile Bootstrap UCL
		0.077794
		BCA Bootstrap UCL
		0.082206
		95% Chebyshev (Mean, Sd) UCL
		0.089301
		97.5% Chebyshev (Mean, Sd) UCL
		0.097971
		99% Chebyshev (Mean, Sd) UCL
		0.115
RECOMMENDATION		
Data are Non-parametric (0.05)		
Use Student's-t UCL		
or Modified-t UCL		

Creek Segment E

Variable: Total PCBs

Raw Statistics			
Number of Valid Samples	17	Shapiro-Wilk Test Statistic	0.442856
Number of Unique Samples	16	Shapiro-Wilk 5% Critical Value	0.892
Minimum	0.04605	Data not normal at 5% significance level	
Maximum	1.2517		
Mean	0.186863	95% UCL (Assuming Normal Distribution)	
Median	0.0606	Student's-t UCL	0.332486
Standard Deviation	0.343906		
Variance	0.118271		
Coefficient of Variation	1.840414	Gamma Distribution Test	
Skewness	2.739161	A-D Test Statistic	3.849273
Gamma Statistics			
k hat	0.810163	A-D 5% Critical Value	0.773902
k star (bias corrected)	0.706408	K-S Test Statistic	0.398621
Theta hat	0.230649	K-S 5% Critical Value	0.216738
Theta star	0.264526	Data do not follow gamma distribution	
nu hat	27.54553	at 5% significance level	
nu star	24.01789	95% UCLs (Assuming Gamma Distribution)	
Approx.Chi Square Value (.05)	13.86054	Approximate Gamma UCL	0.323801
Adjusted Level of Significance	0.03461	Adjusted Gamma UCL	0.343765
Adjusted Chi Square Value	13.05561		
Log-transformed Statistics			
Minimum of log data	-3.078028	Lognormal Distribution Test	
Maximum of log data	0.224503	Shapiro-Wilk Test Statistic	0.599714
Mean of log data	-2.408724	Shapiro-Wilk 5% Critical Value	0.892
Standard Deviation of log data	0.966955	Data not lognormal at 5% significance level	
Variance of log data	0.935001	95% UCLs (Assuming Lognormal Distribution)	
		95% H-UCL	0.271338
		95% Chebyshev (MVUE) UCL	0.293609
		97.5% Chebyshev (MVUE) UCL	0.360845
		99% Chebyshev (MVUE) UCL	0.492917
RECOMMENDATION			
Data are Non-parametric (0.05)		95% Non-parametric UCLs	
Use 95% Chebyshev (Mean, Sd) UCL		CLT UCL	0.324059
		Adj-CLT UCL (Adjusted for skewness)	0.383269
		Mod-t UCL (Adjusted for skewness)	0.341722
		Jackknife UCL	0.332486
		Standard Bootstrap UCL	0.321767
		Bootstrap-t UCL	2.272299
		Hall's Bootstrap UCL	1.824823
		Percentile Bootstrap UCL	0.330918
		BCA Bootstrap UCL	0.375809
		95% Chebyshev (Mean, Sd) UCL	0.550436
		97.5% Chebyshev (Mean, Sd) UCL	0.707755
		99% Chebyshev (Mean, Sd) UCL	1.016776

Creek Segment F

Variable: Arsenic

Raw Statistics			
Number of Valid Samples	16	Shapiro-Wilk Test Statistic	0.952327
Number of Unique Samples	14	Shapiro-Wilk 5% Critical Value	0.887
Minimum	2.9	Data are normal at 5% significance level	
Maximum	19		
Mean	9.7125	95% UCL (Assuming Normal Distribution)	
Median	9.125	Student's-t UCL	11.38037
Standard Deviation	3.805632		
Variance	14.48283		
Coefficient of Variation	0.391828	A-D Test Statistic	0.459906
Skewness	0.565775	A-D 5% Critical Value	0.740801
Gamma Statistics			
k hat	6.158095	K-S Test Statistic	0.172473
k star (bias corrected)	5.045119	K-S 5% Critical Value	0.215634
Theta hat	1.577192	Data follow gamma distribution	
Theta star	1.925128	at 5% significance level	
nu hat	197.059	95% UCLs (Assuming Gamma Distribution)	
nu star	161.4438	Approximate Gamma UCL	11.78419
Approx.Chi Square Value (.05)	133.0616	Adjusted Gamma UCL	12.04969
Adjusted Level of Significance	0.03348		
Adjusted Chi Square Value	130.1298		
Log-transformed Statistics			
Minimum of log data	1.064711	Lognormal Distribution Test	
Maximum of log data	2.944439	Shapiro-Wilk Test Statistic	0.90734
Mean of log data	2.190028	Shapiro-Wilk 5% Critical Value	0.887
Standard Deviation of log data	0.450267	Data are lognormal at 5% significance level	
Variance of log data	0.20274		
95% Non-parametric UCLs			
RECOMMENDATION		CLT UCL	11.27743
Data are normal (0.05)		Adj-CLT UCL (Adjusted for skewness)	11.42122
Use Student's-t UCL		Mod-t UCL (Adjusted for skewness)	11.40279
		Jackknife UCL	11.38037
		Standard Bootstrap UCL	11.25989
		Bootstrap-t UCL	11.52267
		Hall's Bootstrap UCL	11.90343
		Percentile Bootstrap UCL	11.29375
		BCA Bootstrap UCL	11.27813
		95% Chebyshev (Mean, Sd) UCL	13.85959
		97.5% Chebyshev (Mean, Sd) UCL	15.65404
		99% Chebyshev (Mean, Sd) UCL	19.17889

Creek Segment F

Variable: Benzo(a)pyrene

Raw Statistics		
Number of Valid Samples	16	Shapiro-Wilk Test Statisticic
Number of Unique Samples	9	Shapiro-Wilk 5% Critical Value
Minimum	0.049	Data not normal at 5% significance level
Maximum	0.19	
Mean	0.0695	95% UCL (Assuming Normal Distribution)
Median	0.06	Student's-t UCL
Standard Deviation	0.033029	
Variance	0.001091	
Coefficient of Variation	0.475234	Gamma Distribution Test
Skewness	3.650745	A-D Test Statistic
Gamma Statistics		
k hat	8.607352	A-D 5% Critical Value
k star (bias corrected)	7.03514	K-S Test Statistic
Theta hat	0.008074	K-S 5% Critical Value
Theta star	0.009879	Data do not follow gamma distribution
nu hat	275.4353	at 5% significance level
nu star	225.1245	
Approx.Chi Square Value (.05)	191.3889	95% UCLs (Assuming Gamma Distribution)
Adjusted Level of Significance	0.03348	Approximate Gamma UCL
Adjusted Chi Square Value	187.8494	Adjusted Gamma UCL
Log-transformed Statistics		
Minimum of log data	-3.015935	Lognormal Distribution Test
Maximum of log data	-1.660731	Shapiro-Wilk Test Statisticic
Mean of log data	-2.725642	Shapiro-Wilk 5% Critical Value
Standard Deviation of log data	0.308403	Data not lognormal at 5% significance level
Variance of log data	0.095112	
		95% UCLs (Assuming Lognormal Distribution)
		95% H-UCL
		95% Chebyshev (MVUE) UCL
		97.5% Chebyshev (MVUE) UCL
		99% Chebyshev (MVUE) UCL
RECOMMENDATION		
Data are Non-parametric (0.05)		95% Non-parametric UCLs
Use Student's-t UCL		CLT UCL
or Modified-t UCL		Adj-CLT UCL (Adjusted for skewness)
		Mod-t UCL (Adjusted for skewness)
		0.085231
		Jackknife UCL
		Standard Bootstrap UCL
		Bootstrap-t UCL
		Hall's Bootstrap UCL
		Percentile Bootstrap UCL
		BCA Bootstrap UCL
		95% Chebyshev (Mean, Sd) UCL
		97.5% Chebyshev (Mean, Sd) UCL
		99% Chebyshev (Mean, Sd) UCL
		0.083082
		0.091134
		0.123012
		0.138403
		0.084813
		0.094188
		0.105492
		0.121066
		0.151658

Site M**Variable: Arsenic**

Raw Statistics			
Number of Valid Samples	9	Shapiro-Wilk Test Statistic	0.64836
Number of Unique Samples	9	Shapiro-Wilk 5% Critical Value	0.829
Minimum	2.9	Data not normal at 5% significance level	
Maximum	25		
Mean	7.277778	95% UCL (Assuming Normal Distribution)	
Median	4.6	Student's-t UCL	11.60462
Standard Deviation	6.980469		
Variance	48.72694		
Coefficient of Variation	0.959148	Gamma Distribution Test	
Skewness	2.50879	A-D Test Statistic	0.788439
Gamma Statistics			
k hat	2.104115	A-D 5% Critical Value	0.729461
k star (bias corrected)	1.476817	K-S Test Statistic	0.274811
Theta hat	3.458831	K-S 5% Critical Value	0.282361
Theta star	4.928015	Data follow approximate gamma distribution	
nu hat	37.87406	at 5% significance level	
nu star	26.58271	95% UCLs (Assuming Gamma Distribution)	
Approx.Chi Square Value (.05)	15.82696	Approximate Gamma UCL	12.22364
Adjusted Level of Significance	0.02308	Adjusted Gamma UCL	13.71574
Adjusted Chi Square Value	14.10518	Lognormal Distribution Test	
Log-transformed Statistics			
Minimum of log data	1.064711	Shapiro-Wilk Test Statistic	0.863751
Maximum of log data	3.218876	Shapiro-Wilk 5% Critical Value	0.829
Mean of log data	1.728761	Data are lognormal at 5% significance level	
Standard Deviation of log data	0.680223	95% UCLs (Assuming Lognormal Distribution)	
Variance of log data	0.462704	95% H-UCL	13.32518
		95% Chebyshev (MVUE) UCL	13.86173
		97.5% Chebyshev (MVUE) UCL	16.87754
		99% Chebyshev (MVUE) UCL	22.80151
RECOMMENDATION			
Assuming gamma distribution (0.05)		95% Non-parametric UCLs	
Use Approximate Gamma UCL		CLT UCL	11.10506
		Adj-CLT UCL (Adjusted for skewness)	13.18422
		Mod-t UCL (Adjusted for skewness)	11.92892
		Jackknife UCL	11.60462
		Standard Bootstrap UCL	10.86823
		Bootstrap-t UCL	21.43077
		Hall's Bootstrap UCL	24.41049
		Percentile Bootstrap UCL	11.23333
		BCA Bootstrap UCL	13.91111
		95% Chebyshev (Mean, Sd) UCL	17.42016
		97.5% Chebyshev (Mean, Sd) UCL	21.80878
		99% Chebyshev (Mean, Sd) UCL	30.42937

Site M**Variable: 1,4-Dichlorobenzene**

Raw Statistics			
Number of Valid Samples	9	Shapiro-Wilk Test Statistic	0.728229
Number of Unique Samples	8	Shapiro-Wilk 5% Critical Value	0.829
Minimum	0.105	Data not normal at 5% significance level	
Maximum	4.1		
Mean	0.978333	95% UCL (Assuming Normal Distribution)	
Median	0.37	Student's-t UCL	1.786222
Standard Deviation	1.303363		
Variance	1.698756		
Coefficient of Variation	1.332228	Gamma Distribution Test	
Skewness	2.01918	A-D Test Statistic	0.626488
Gamma Statistics			
k hat	0.720728	A-D 5% Critical Value	0.753712
k star (bias corrected)	0.55456	K-S Test Statistic	0.265897
Theta hat	1.357423	K-S 5% Critical Value	0.289842
Theta star	1.764162	Data follow gamma distribution	
nu hat	12.97311	at 5% significance level	
nu star	9.982074		
Approx.Chi Square Value (.05)	3.929719	95% UCLs (Assuming Gamma Distribution)	
Adjusted Level of Significance	0.02308	Approximate Gamma UCL	2.485113
Adjusted Chi Square Value	3.169869	Adjusted Gamma UCL	3.08082
Log-transformed Statistics			
Minimum of log data	-2.253795	Lognormal Distribution Test	
Maximum of log data	1.410987	Shapiro-Wilk Test Statistic	0.850242
Mean of log data	-0.857035	Shapiro-Wilk 5% Critical Value	0.829
Standard Deviation of log data	1.429209	Data are lognormal at 5% significance level	
Variance of log data	2.042639		
		95% UCLs (Assuming Lognormal Distribution)	
		95% H-UCL	10.61968
		95% Chebyshev (MVUE) UCL	3.092836
		97.5% Chebyshev (MVUE) UCL	4.006247
		99% Chebyshev (MVUE) UCL	5.800465
RECOMMENDATION			
Data follow gamma distribution (0.05)		95% Non-parametric UCLs	
Use Approximate Gamma UCL		CLT UCL	1.692947
		Adj-CLT UCL (Adjusted for skewness)	2.005396
		Mod-t UCL (Adjusted for skewness)	1.834958
		Jackknife UCL	1.786222
		Standard Bootstrap UCL	1.650055
		Bootstrap-t UCL	2.648002
		Hall's Bootstrap UCL	4.339568
		Percentile Bootstrap UCL	1.701111
		BCA Bootstrap UCL	1.965556
		95% Chebyshev (Mean, Sd) UCL	2.872077
		97.5% Chebyshev (Mean, Sd) UCL	3.691501
		99% Chebyshev (Mean, Sd) UCL	5.301101

Site M**Variable: Benzo(a)pyrene**

Raw Statistics			
Number of Valid Samples	8	Shapiro-Wilk Test Statistic	0.746143
Number of Unique Samples	7	Shapiro-Wilk 5% Critical Value	0.818
Minimum	0.055	Data not normal at 5% significance level	
Maximum	0.48		
Mean	0.214125	95% UCL (Assuming Normal Distribution)	
Median	0.099	Student's-t UCL	0.345922
Standard Deviation	0.196761		
Variance	0.038715		
Coefficient of Variation	0.918905	Gamma Distribution Test	
Skewness	0.639406	A-D Test Statistic	0.900195
Gamma Statistics			
k hat	1.308033	A-D 5% Critical Value	0.731138
k star (bias corrected)	0.900854	K-S Test Statistic	0.285004
Theta hat	0.1637	K-S 5% Critical Value	0.299883
Theta star	0.237691	Data follow approximate gamma distribution	
nu hat	20.92853	at 5% significance level	
nu star	14.41367	95% UCLs (Assuming Gamma Distribution)	
Approx.Chi Square Value (.05)	6.854367	Approximate Gamma UCL	0.450271
Adjusted Level of Significance	0.01946	Adjusted Gamma UCL	0.552091
Adjusted Chi Square Value	5.590249		
Log-transformed Statistics			
Minimum of log data	-2.900422	Lognormal Distribution Test	
Maximum of log data	-0.733969	Shapiro-Wilk Test Statistic	0.785511
Mean of log data	-1.969838	Shapiro-Wilk 5% Critical Value	0.818
Standard Deviation of log data	1.0037	Data not lognormal at 5% significance level	
Variance of log data	1.007413	95% UCLs (Assuming Lognormal Distribution)	
		95% H-UCL	0.873812
		95% Chebyshev (MVUE) UCL	0.548243
		97.5% Chebyshev (MVUE) UCL	0.693503
		99% Chebyshev (MVUE) UCL	0.978839
RECOMMENDATION			
Assuming gamma distribution (0.05)		95% Non-parametric UCLs	
Use Approximate Gamma UCL		CLT UCL	0.32855
		Adj-CLT UCL (Adjusted for skewness)	0.345354
		Mod-t UCL (Adjusted for skewness)	0.348543
		Jackknife UCL	0.345922
		Standard Bootstrap UCL	0.321136
		Bootstrap-t UCL	0.360388
		Hall's Bootstrap UCL	0.284856
		Percentile Bootstrap UCL	0.319375
		BCA Bootstrap UCL	0.324375
		95% Chebyshev (Mean, Sd) UCL	0.517353
		97.5% Chebyshev (Mean, Sd) UCL	0.64856
		99% Chebyshev (Mean, Sd) UCL	0.906291

Site M**Variable: Copper**

Raw Statistics			
Number of Valid Samples	9	Shapiro-Wilk Test Statistic	0.695854
Number of Unique Samples	9	Shapiro-Wilk 5% Critical Value	0.829
Minimum	110	Data not normal at 5% significance level	
Maximum	4900		
Mean	1437.778	95% UCL (Assuming Normal Distribution)	
Median	750	Student's-t UCL	2524.87
Standard Deviation	1753.801		
Variance	3075819		
Coefficient of Variation	1.2198	Gamma Distribution Test	
Skewness	1.588166	A-D Test Statistic	0.663765
Gamma Statistics			
k hat	0.935964	A-D 5% Critical Value	0.745517
k star (bias corrected)	0.69805	K-S Test Statistic	0.295139
Theta hat	1536.146	K-S 5% Critical Value	0.28751
Theta star	2059.705	Data follow approximate gamma distribution	
nu hat	16.84736	at 5% significance level	
nu star	12.5649	95% UCLs (Assuming Gamma Distribution)	
Approx.Chi Square Value (.05)	5.600342	Approximate Gamma UCL	3225.792
Adjusted Level of Significance	0.02308	Adjusted Gamma UCL	3878.567
Adjusted Chi Square Value	4.657787		
Log-transformed Statistics			
Minimum of log data	4.70048	Lognormal Distribution Test	
Maximum of log data	8.49699	Shapiro-Wilk Test Statistic	0.92508
Mean of log data	6.64925	Shapiro-Wilk 5% Critical Value	0.829
Standard Deviation of log data	1.202911	Data are lognormal at 5% significance level	
Variance of log data	1.446995	95% UCLs (Assuming Lognormal Distribution)	
		95% H-UCL	7961.287
		95% Chebyshev (MVUE) UCL	3988.318
		97.5% Chebyshev (MVUE) UCL	5101.096
		99% Chebyshev (MVUE) UCL	7286.934
RECOMMENDATION			
Assuming gamma distribution (0.05)		95% Non-parametric UCLs	
Use Approximate Gamma UCL		CLT UCL	2399.36
		Adj-CLT UCL (Adjusted for skewness)	2730.045
		Mod-t UCL (Adjusted for skewness)	2576.451
		Jackknife UCL	2524.87
		Standard Bootstrap UCL	2358.221
		Bootstrap-t UCL	7087.674
		Hall's Bootstrap UCL	11560.55
		Percentile Bootstrap UCL	2397.778
		BCA Bootstrap UCL	2690
		95% Chebyshev (Mean, Sd) UCL	3985.992
		97.5% Chebyshev (Mean, Sd) UCL	5088.607
		99% Chebyshev (Mean, Sd) UCL	7254.479

Site M**Variable: Dibenzo(a,h)anthracene**

Raw Statistics			
Number of Valid Samples	5	Shapiro-Wilk Test Statistic	0.719687
Number of Unique Samples	4	Shapiro-Wilk 5% Critical Value	0.762
Minimum	0.055	Data not normal at 5% significance level	
Maximum	0.15		
Mean	0.0806	95% UCL (Assuming Normal Distribution)	
Median	0.06	Student's-t UCL	0.118518
Standard Deviation	0.039772		
Variance	0.001582		
Coefficient of Variation	0.493447	Gamma Distribution Test	
Skewness	1.986778	A-D Test Statistic	0.700098
Gamma Statistics			
k hat	6.670518	A-D 5% Critical Value	0.680099
k star (bias corrected)	2.801541	K-S Test Statistic	0.323794
Theta hat	0.012083	K-S 5% Critical Value	0.358069
Theta star	0.02877	95% UCLs (Assuming Gamma Distribution)	
nu hat	66.70518	Approximate Gamma UCL	0.133311
nu star	28.01541	Adjusted Gamma UCL	0.169522
Approx.Chi Square Value (.05)	16.93813		
Adjusted Level of Significance	0.0086	Lognormal Distribution Test	
Adjusted Chi Square Value	13.32006	Shapiro-Wilk Test Statistic	0.786608
Log-transformed Statistics			
Minimum of log data	-2.900422	Shapiro-Wilk 5% Critical Value	0.762
Maximum of log data	-1.89712	Data are lognormal at 5% significance level	
Mean of log data	-2.595082		
Standard Deviation of log data	0.4116	95% UCLs (Assuming Lognormal Distribution)	
Variance of log data	0.169414	95% H-UCL	0.141108
		95% Chebyshev (MVUE) UCL	0.143469
		97.5% Chebyshev (MVUE) UCL	0.171013
		99% Chebyshev (MVUE) UCL	0.225117
RECOMMENDATION			
Assuming gamma distribution (0.05)		95% Non-parametric UCLs	
Use Approximate Gamma UCL		CLT UCL	0.109856
		Adj-CLT UCL (Adjusted for skewness)	0.126743
		Mod-t UCL (Adjusted for skewness)	0.121152
		Jackknife UCL	0.118518
		Standard Bootstrap UCL	N/R
		Bootstrap-t UCL	N/R
		Hall's Bootstrap UCL	N/R
		Percentile Bootstrap UCL	N/R
		BCA Bootstrap UCL	N/R
		95% Chebyshev (Mean, Sd) UCL	0.15813
		97.5% Chebyshev (Mean, Sd) UCL	0.191677
		99% Chebyshev (Mean, Sd) UCL	0.257574

Site M**Variable: Dioxin TEQ-HH**

Raw Statistics			
Number of Valid Samples	9	Shapiro-Wilk Test Statistic	0.543188
Number of Unique Samples	9	Shapiro-Wilk 5% Critical Value	0.829
Minimum	8.38E-05	Data not normal at 5% significance level	
Maximum	0.005225		
Mean	0.000959	95% UCL (Assuming Normal Distribution)	
Median	0.000467	Student's-t UCL	0.001964
Standard Deviation	0.001621		
Variance	2.63E-06		
Coefficient of Variation	1.69088	Gamma Distribution Test	
Skewness	2.850527	A-D Test Statistic	0.707406
Gamma Statistics			
k hat	0.765199	A-D 5% Critical Value	0.750974
k star (bias corrected)	0.584207	K-S Test Statistic	0.26971
Theta hat	0.001253	K-S 5% Critical Value	0.289135
Theta star	0.001641	95% UCLs (Assuming Gamma Distribution)	
nu hat	13.77358	Approximate Gamma UCL	0.002364
nu star	10.51572	Adjusted Gamma UCL	0.002908
Approx.Chi Square Value (.05)	4.265726		
Adjusted Level of Significance	0.02308	Lognormal Distribution Test	
Adjusted Chi Square Value	3.46656	Shapiro-Wilk Test Statistic	0.930968
Log-transformed Statistics			
Minimum of log data	-9.386839	Shapiro-Wilk 5% Critical Value	0.829
Maximum of log data	-5.2543	Data are lognormal at 5% significance level	
Mean of log data	-7.730057		
Standard Deviation of log data	1.243184	95% UCLs (Assuming Lognormal Distribution)	
Variance of log data	1.545507	95% H-UCL	0.005247
		95% Chebyshev (MVUE) UCL	0.002411
		97.5% Chebyshev (MVUE) UCL	0.003091
		99% Chebyshev (MVUE) UCL	0.004428
RECOMMENDATION			
Data follow gamma distribution (0.05)		95% Non-parametric UCLs	
Use Approximate Gamma UCL		CLT UCL	0.001848
		Adj-CLT UCL (Adjusted for skewness)	0.002396
		Mod-t UCL (Adjusted for skewness)	0.002049
		Jackknife UCL	0.001964
		Standard Bootstrap UCL	0.001816
		Bootstrap-t UCL	0.005557
		Hall's Bootstrap UCL	0.006199
		Percentile Bootstrap UCL	0.002011
		BCA Bootstrap UCL	0.002221
		95% Chebyshev (Mean, Sd) UCL	0.003314
		97.5% Chebyshev (Mean, Sd) UCL	0.004334
		99% Chebyshev (Mean, Sd) UCL	0.006336

Site M**Variable: Heptachlor**

Raw Statistics			
Number of Valid Samples	9	Shapiro-Wilk Test Statistic	0.485654
Number of Unique Samples	7	Shapiro-Wilk 5% Critical Value	0.829
Minimum	0.0023	Data not normal at 5% significance level	
Maximum	0.16		
Mean	0.026644	95% UCL (Assuming Normal Distribution)	
Median	0.011	Student's-t UCL	0.057826
Standard Deviation	0.050304		
Variance	0.002531		
Coefficient of Variation	1.887986	Gamma Distribution Test	
Skewness	2.933811	A-D Test Statistic	1.241675
Gamma Statistics			
k hat	0.728633	A-D 5% Critical Value	0.753104
k star (bias corrected)	0.559829	K-S Test Statistic	0.374674
Theta hat	0.036568	K-S 5% Critical Value	0.28969
Theta star	0.047594	Data do not follow gamma distribution	
nu hat	13.11539	at 5% significance level	
nu star	10.07693	95% UCLs (Assuming Gamma Distribution)	
Approx.Chi Square Value (.05)	3.98905	Approximate Gamma UCL	0.067308
Adjusted Level of Significance	0.02308	Adjusted Gamma UCL	0.083328
Adjusted Chi Square Value	3.222146		
Log-transformed Statistics			
Minimum of log data	-6.074846	Lognormal Distribution Test	
Maximum of log data	-1.832581	Shapiro-Wilk Test Statistic	0.865388
Mean of log data	-4.450007	Shapiro-Wilk 5% Critical Value	0.829
Standard Deviation of log data	1.164187	Data are lognormal at 5% significance level	
Variance of log data	1.355331		
		95% UCLs (Assuming Lognormal Distribution)	
		95% H-UCL	0.105028
		95% Chebyshev (MVUE) UCL	0.056943
		97.5% Chebyshev (MVUE) UCL	0.072644
		99% Chebyshev (MVUE) UCL	0.103486
RECOMMENDATION			
Data are lognormal (0.05)		95% Non-parametric UCLs	
Use 95% Chebyshev (MVUE) UCL		CLT UCL	0.054226
		Adj-CLT UCL (Adjusted for skewness)	0.071747
		Mod-t UCL (Adjusted for skewness)	0.060559
		Jackknife UCL	0.057826
		Standard Bootstrap UCL	0.053029
		Bootstrap-t UCL	0.324175
		Hall's Bootstrap UCL	0.281425
		Percentile Bootstrap UCL	0.059478
		BCA Bootstrap UCL	0.076056
		95% Chebyshev (Mean, Sd) UCL	0.099735
		97.5% Chebyshev (Mean, Sd) UCL	0.131361
		99% Chebyshev (Mean, Sd) UCL	0.193485

Site M**Variable: Heptachlor epoxide**

Raw Statistics		
Number of Valid Samples	9	Shapiro-Wilk Test Statisticic
Number of Unique Samples	7	Shapiro-Wilk 5% Critical Value
Minimum	0.0023	Data not normal at 5% significance level
Maximum	0.86	
Mean	0.108033	95% UCL (Assuming Normal Distribution)
Median	0.011	Student's-t UCL
Standard Deviation	0.282184	
Variance	0.079628	
Coefficient of Variation	2.612013	Gamma Distribution Test
Skewness	2.992015	A-D Test Statisticic
Gamma Statistics		
k hat	0.363716	A-D 5% Critical Value
k star (bias corrected)	0.316551	K-S Test Statisticic
Theta hat	0.297027	K-S 5% Critical Value
Theta star	0.341282	Data do not follow gamma distribution
nu hat	6.54688	at 5% significance level
nu star	5.69792	95% UCLs (Assuming Gamma Distribution)
Approx.Chi Square Value (.05)	1.487022	Approximate Gamma UCL
Adjusted Level of Significance	0.02308	Adjusted Gamma UCL
Adjusted Chi Square Value	1.081881	
Log-transformed Statistics		
Minimum of log data	-6.074846	Lognormal Distribution Test
Maximum of log data	-0.150823	Shapiro-Wilk Test Statisticic
Mean of log data	-4.062589	Shapiro-Wilk 5% Critical Value
Standard Deviation of log data	1.669448	Data not lognormal at 5% significance level
Variance of log data	2.787055	
		95% UCLs (Assuming Lognormal Distribution)
		95% H-UCL
		95% Chebyshev (MVUE) UCL
		97.5% Chebyshev (MVUE) UCL
		99% Chebyshev (MVUE) UCL
RECOMMENDATION		
Data are Non-parametric (0.05)		95% Non-parametric UCLs
Use 99% Chebyshev (Mean, Sd) UCL		CLT UCL
		Adj-CLT UCL (Adjusted for skewness)
		Mod-t UCL (Adjusted for skewness)
		Jackknife UCL
		Standard Bootstrap UCL
		Bootstrap-t UCL
		Hall's Bootstrap UCL
		Percentile Bootstrap UCL
		BCA Bootstrap UCL
		95% Chebyshev (Mean, Sd) UCL
		97.5% Chebyshev (Mean, Sd) UCL
		99% Chebyshev (Mean, Sd) UCL

Recommended UCL exceeds the maximum observation
Consider using 95% or 97.5% Chebyshev (Mean, Sd) UCL

Site M**Variable: Total PCBs**

Raw Statistics			
Number of Valid Samples	9	Shapiro-Wilk Test Statistic	0.60796
Number of Unique Samples	9	Shapiro-Wilk 5% Critical Value	0.829
Minimum	0.555	Data not normal at 5% significance level	
Maximum	27.138		
Mean	5.398011	95% UCL (Assuming Normal Distribution)	
Median	1.726	Student's-t UCL	10.68166
Standard Deviation	8.524087		
Variance	72.66005	Gamma Distribution Test	
Coefficient of Variation	1.579116	A-D Test Statistic	0.716734
Skewness	2.570313	A-D 5% Critical Value	0.750055
Gamma Statistics			
k hat	0.793959	K-S Test Statistic	0.266588
k star (bias corrected)	0.60338	K-S 5% Critical Value	0.288862
Theta hat	6.798852	Data follow gamma distribution	
Theta star	8.946284	at 5% significance level	
nu hat	14.29127	95% UCLs (Assuming Gamma Distribution)	
nu star	10.86084	Approximate Gamma UCL	13.06952
Approx.Chi Square Value (.05)	4.485777	Adjusted Gamma UCL	16.01109
Adjusted Level of Significance	0.02308		
Adjusted Chi Square Value	3.661647	Lognormal Distribution Test	
Log-transformed Statistics			
Minimum of log data	-0.588787	Shapiro-Wilk Test Statistic	0.934332
Maximum of log data	3.300935	Shapiro-Wilk 5% Critical Value	0.829
Mean of log data	0.937773	Data are lognormal at 5% significance level	
Standard Deviation of log data	1.194253	95% UCLs (Assuming Lognormal Distribution)	
Variance of log data	1.426241	95% H-UCL	25.53193
		95% Chebyshev (MVUE) UCL	13.0233
		97.5% Chebyshev (MVUE) UCL	16.64757
		99% Chebyshev (MVUE) UCL	23.76676
RECOMMENDATION			
Data follow gamma distribution (0.05)		95% Non-parametric UCLs	
Use Approximate Gamma UCL		CLT UCL	10.07164
		Adj-CLT UCL (Adjusted for skewness)	12.67282
		Mod-t UCL (Adjusted for skewness)	11.08739
		Jackknife UCL	10.68166
		Standard Bootstrap UCL	9.860835
		Bootstrap-t UCL	32.78076
		Hall's Bootstrap UCL	29.01419
		Percentile Bootstrap UCL	10.46939
		BCA Bootstrap UCL	12.48067
		95% Chebyshev (Mean, Sd) UCL	17.78322
		97.5% Chebyshev (Mean, Sd) UCL	23.14231
		99% Chebyshev (Mean, Sd) UCL	33.66921